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TRANSACTIONS

OF THE

AMERICAN ENTOMOLOGICAL SOCIETY

VOLUME LV

A SUPPLEMENTAL REVISION OF THE GENUS ATHYSANUS IN NORTH AMERICA

(HOMOPTERA: CICADELLIDAE)

BY E. D. BALL.

University of Arizona, Tucson, Arizona

Ultra conservatism with reference to the establishment of genera on the part of the older systematic workers in the leaf-hoppers has been the greatest handicap to progress in these groups. From the time of Signoret, who lumped all the previously proposed genera in the Tettigonidae and dealt with three hundred and ninety-six species in a single genus, down to very recent times the workers have been content to struggle along with great unwieldy aggregations of very diverse forms under ill-defined genera such as *Athysanus, Thamnotettix, Deltocephalus* and *Phlepsius.* The Van Duzee catalog for example lists 1469 species of Heteroptera north of Mexico under four hundred and sixty-five genera, or an average of three species to a genus. In the Homoptera the same catalog lists 1476 species under two hundred and thirty-three genera or an average of six species to a genus. In the Cicadellidae alone he lists six hundred and ninety-eight species under sixty-eight genera, or an average of ten species to a genus. In the four genera mentioned above he lists two hundred and twenty-eight species, or an average of fifty-seven species per genera. Many more have been added since that time, making nearly one hundred species in this restricted area in the largest genus. Perhaps Melichar in his monograph of the Cicadellinae (Tet-

Key to the Genera
(*Genus Euscelis of Van Duzee Catalogue*)

A. Vertex transverse much wider than long, margins nearly parallel or the anterior but slightly in advance of eyes anterior margin in profile obtusely rounding to front.

  B. Front wedge shaped below, narrowing regularly to clypeus. Species large finely irrorate with fuscous. 1—*Remadosus* new genus

  BB. Front broad below, suddenly rounding into clypeus. Species smaller, often with black spots or lines.

    C. Vertex with black spots. Species relatively stout parallel margined.

      D. Elytra straw or milky, nervures light—ovipositor normal........................2—*Athysanus* Burm.

      DD. Elytra subhyaline nervures dark—ovipositor extremely long. ....3—*Exitianus* new genus

    CC. Vertex with one or more black bands—species elongate more or less wedge shaped—elytra often greenish subhyaline ....4—*Drylix* Edwd.

AA. Vertex flat or conical, produced before eyes, not definitely transverse. Anterior margin in profile actually conical or angled.

  E. Vertex distinctly wider than its median length much wider than the long diameter of eye.

    F. Vertex and front obtusely conically pointed, vertex usually convex between the eyes, front inflated, markings on vertex in the form of transverse lines or absent.

      G. Broad stout straw colored species with blunt heads, base of vertex flat.................5—*Euscelis* Brul.

      GG. Narrow, smaller, brown or black species with acutely conical heads and transverse bands on vertex. 6—*Ophiola* Edwd.

    FF. Vertex and front angled, the vertex flat with a definite margin; front very flat in both diameters anterior margin with definite black spots or sometimes united into a single line. ....7—*Commellus* O&B.

  EE. Vertex narrow its basal width rarely equal to its middle length, often narrower than the long diameter of an eye..................................8—*Stirellus* O&B.

tigoninae) has gone to the other extreme, for he recognizes one hundred and one genera, sixty-eight of which are new, in one subdivision of the material that Signoret placed in the single genus *Tettigonia* seventy-five years before. Melichar's genera however, are definable, recognizable, and indicate lines of evolution; which is more than could be said for the old aggregates.

Osborn and Ball in 1902 revised the North American forms of *Athysanus* (*Euscelis* of Van Duzee Catalogue) dividing these into four sub-genera. Since that time several additional genera have been designated, a number of species added, and progress has been made in knowledge of generic and specific relations, including some synonomy. Two additional genera have been established in this paper in order to properly indicate diverse lines of development and further study will probably indicate other distinct groups.

REMADOSUS new genus.

Intermediate in character between true *Athysanus* and true *Phlepsius* evidently related to *Selanocephalus* in the location of ocelli on front below the vertex margin. Large species with extremely broad short rounding heads heavily and very uniformly irrorate with fuscous sometimes omitting transverse bands on vertex and pronotum and a few definite spots on elytra.

Vertex transverse, almost parallel margined, broadly rounding to front; front very broad, about parallel margined to the antennae then wedge shaped to clypeus. Clypeus expanding towards apex, the margins of genae deep and broadly rounding below. Ocelli in suture, distant from eyes, well under the vertex level and situated in a broad depression which gives the impression of a slightly produced apex to head. Pronotum

Key to species and Varieties of Remadosus.

A. A definite ivory white costal stripe and usually an ivory white band on pronotum. ....1—*magnus* O&B.
  B. Ground color rusty straw. ....var. *magnus* O&B.
  BB. Ground color piceous. ....var. *piceous* Osb.
AA. Costal margin of elytra of same shade as the disc, ivory band on pronotum faint or wanting. ....2—*fumidus* Osb.
  C. Ground Color reddish straw. ....var. *drakei* Osb.
  CC. Color piceous ....var. *fumidus* Osb.

short, transverse, broadly curved in front, the lateral margins long and carinate. Elytra long, slightly narrowing apically; venation as in *Athysanus* the apical and anteapical cells nearly parallel margined.

Type of the genus *Athysanus magnus* Osborn and Ball.

Remadosus magnus (Osborn & Ball)

Athysanus magnus Osborn & Ball, Proc. Ia. Acad. Sc., IV, p. 225, pl. 26, 1897.

This species has been taken from eastern Wyoming and Colorado to Minnesota and Iowa in the plains region and again along the gulf coast in Louisiana and Florida. The writer has taken it in Colorado and Iowa from the margins of slough grass (*Spartina cynosuroides*) areas. Mr. W. E. Stone and the writer found this species and its var. *piceous* abundant as nymphs and adults on a low meadow just above the tide flats at Tampa, Florida, September 10, 1927. They were taken on an almost pure stand of *Spartina patens*. The great majority of these were darker than typical *magnus* but only a few of the females were of the shiny black *piceous* form with the white band in sharp contrast.

Remadosus fumidus Osborn

Athysanus fumidus Osborn, Fla. Ent., VI, p. 19, 1922.

This species is almost as variable in color as *magnus* but lacks the white on costa and only rarely shows traces of the white band on pronotum. It is slightly smaller and has much more closely reticulate elytra. The males are concolorous, while the females of either the dark *fumidius* or the light *drakei* forms usually show a number of milky spots on the elytra arranged in two fairly definite transverse rows.

Mr. W. E. Stone, Mr. J. A. Reeves and the writer collected quite a number of this species from an isolated spot in a low flat-woods strip between cypress swamps. The males were taken from July 8th to Sept. 22nd, but only on the latter date and Nov. 9th were any females captured. These were all taken individually after hard sweeping around the borders of wet spots just below the limits of saw palmetto and pine and appeared to be associated with a grass with broad basal leaves later determined by Dr. John K. Small as *Rynchospora* n. sp. There was noted an occasional stalk of an undetermined *Spartina* growing in this area and after the later discovery that the food plant of *magnus* var. *piceous* was a similar species doubts arose as to which plant was the true host.

ATHYSANUS Burmeister[1]

Athysanus Burmeister, Geneva Ins., I, pl. 14, 1838.

Athysanus frigidus Ball, *almus* V. D. and *dentatus* O. & B. are all that are left in the genus *Athysanus* as here limited Of these *frigidus* is probably the most typical. The writer has taken this species in abundance feeding on White Sage (*Artemesia frigida*) at Fort Collins, Colorado, and in limited numbers in Western Nebraska, Utah, Nevada, and in California east of the Sierra Nevadas.

EXITIANUS new genus

Resembling *Euscelis* and *Athysanus* but with blunter head, long flaring hyaline elytra with dark nervures and a long, acute exserted ovipositor.

Vertex at least twice wider the long, obtusely angular, the anterior margin broadly rounding; front not inflated, moderately broad, wedge shaped, the marginal sutures continuous with those of clypeus. Elytra extremely long, inclined to be flaring, transparent with dark veins. Female ovipositor extremely long, the acute apex exceeding the slender pygofers and often equalling or exceeding the elytra.

Type of the genus *Cicadula exitiosa* Uhl.=*obscurinervis* Stal.

Exitianus obscurinervis Stal

Jassus (*Thamnotettix*) *obscurinervis* Stal. Eug. Resa. Ins., Hemip., p. 293, 1858. (S. A.)

Cicadula exitiosa Uhler, Am. Ent., III, p. 72, 1880. (U. S.)

Athysanus picatus Gibson, Proc. Bio. Soc. Wash., XXXII, p. 26, 1919. (C. A.)

Athysanus miniaturatus Gibson, Proc. Bio. Soc. Wash., XXXII, p. 26, 1919. (C. A.)

Doctor Osborn has recently called attention to the fact that *obscurinervis* Stal. is the proper name for this widely distributed and exceedingly variable species. The writer has studied the types of Gibson's species from Honduras and finds them simply color variations.

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[1] Note—*Eutettix osborni* Ball equals *Athysanus stactogalus* of Europe, as Olsen has pointed out. This species is however the type of the genus *Opsius* Fieb. and should be known as *Opsius stactogalus* Am. It is much more closely related to *Eutettix* and *Thamnotettix* than to *Athysanus* and should be placed between these genera.

DRYLIX Edwards

Drylix Edwards, Ent. Mo. Mag., LVIII, p. 207, 1922.

This group with *striola* as the type is strikingly distinct in its extremely broad head and long narrow elytra. As the number of species has doubled since the former revision and a fifth one is at hand the following key may assist in placing them:

Key to North American Species of Drylix Edwards

A. Vertex definitely but very obtusely pointed—species slender, pale green with a single black band on vertex.

B. Medium size (4-6 mm.)—vertex twice wider than long (U. S. Europe). ....1—*striolus* Fall.

BB. Much smaller—vertex not twice wider than long. (N. J.) 2—*cuneatus* S. & DeL.

AA. Vertex but slightly advanced in the middle—species stouter, often heavily marked with black.

C. Elytra long, appressed posteriorly. Species larger than *striolus.*

D. Male plates large semicircular (Northern U. S.). 3—*parallelus* V.D.

DD. Male plates caliper-like. (Mich.) 4—*divaricatus* S. & DeL.

CC. Elytra little longer than the body. Species little longer than *striolus*. Male plates separated. (Utah.) 5—*uneolus* new species.

Drylix uneolus new species

Form of *parallelus* but smaller and shorter, slightly larger than *striolus.* Green with black bands on vertex. Length 4.5 mm.

Head distinctly wider than pronotum and scarcely as long; vertex almost parallel margined, rounding to the broad front, the apex bluntly conical. Elytra narrow as in *parallelus* but not as long, only slightly exceeding the abdomen.

Color—Greenish straw, sometimes almost straw in the females. Typically colored examples have a straight black band just back of the ocelli, a pair of dots at the apex of vertex and a broken vermiculate line before the base. The pronotum is olive with about four dots on the arcuated impressed line. Scutellum with a pair of triangular black spots just inside the angles and extending under the pronotum and sometimes four dots on disc. The elytra are often smoky with light nervures, or this may be reduced to smoky margins to the principal nervures. Face pale yellow, with all the sutures and a median stripe on clypeus broadly black, an arcuated line above and about 9 interrupted arcs on the front black. Pale examples and especially females may lose all markings except the black band on vertex.

Ultimate segment in female long, the posterior margin nearly truncate with a semicircular black bordered median notch. Male valve obtusely triangular; plates very broad at base and almost as broad at apex, cut out obliquely from the inside to the widely divergent apices as in *Euscelis extrusus.*

Holotype.—Male; Peterboro, Utah, June 25. *Allotype* female and nine *paratypes* taken by the author sweeping a wet meadow near Peterboro, Utah, June 25th. The four males all agree in the strikingly distinct genitalia, the vermiculate line on vertex and the spots on scutellum. Types in author's collection.

EUSCELIS Brullé

Euscelis Brullé Exped. Sci. Moreé, III, p. 109, 1832.

This name will supersede *Metathysanus* Dahl and *Conosanus* O.&B. as the oldest generic name for the group which includes *obsoletus, extrusus, ovatus, alpinus, hyperboreus* and *varus.*

Euscelis obsoletus (Kirschbaum)

Jassus obsoletus Kirschbaum, Cicadinen von Wiesbaden und Frankfort, p. 109, 1868.

Athysanus relativus Gillette and Baker, Hemip. Colo., p. 93, 1895.

Euscelis deceptus Sanders and DeLong, Ann. Ent. Soc. Am., x, p. 87, 1917.

This species occurs commonly in low meadows from Vancouver Island to Ontario and Woods Hole, Massachusetts, south to Colorado and Illinois. The writer has taken it abundantly in Colorado, Wisconsin, and at Woods Hole, Massachusetts. Provancher was the first to recognize this species in America. Osborn and Ball compared the Colorado and Iowa examples with European examples from Dr. Melichar and could find no difference, so substituted this name for *relativus* G.&B. Van Duzee in his catalog however did not recognize *obsoletus* as occurring in America and restored *relativus.* The writer has recently gone over European material from two sources and compared it with American and can find no character by which they can be separated; instead they appear to be remarkably uniform in structure and color markings. *E. deceptus* S. & DeL. was described from Wisconsin. The writer took a long series of *obsoletus* in that state that fit the description and figures of *deceptus* so completely as to leave little room for doubt as to their identity.

OPHIOLA Edwards

Ophiola Edwards, Ent. Mo. Mag., LVIII, p. 206, 1822.

This genus with *striatula* Fall as the type will include all that Osborn and Ball included under "AA" of *Conosanus*. As there are a considerable number of additions and corrections in this group including a new key it has been thought best to make it the subject of a separate paper.

COMMELLUS Osborn & Ball

Euscelis ozarcensis Gibson[2] proves on examination of the types to be the same as *Commellus estacadus* Ball which is now known from Texas, Missouri (Gibson), and Tennessee (DeLong).

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[2] Can. Ent., 42, p. 184, 1917.

STUDIES IN COSTA RICAN DERMAPTERA AND ORTHOPTERA

PAPER TWO

NEW GENERA AND SPECIES OF ACRIDIDAE

BY JAMES A. G. REHN

The first study of this series appeared in these Transactions in 1922[1], and since its appearance two personal visits to Costa Rica, and the acquisition of much material collected by others, have made my acquaintance with the orthopterous fauna of that country much more intimate and extensive. As is usually the case this development has multiplied the difficulties which so frequently retard rapid publication of results, if for no other reason than the very richness of the accumulated collections. A great deal of preliminary work has been done on the splendid collections assembled, and my colleague Mr. Hebard also has been compelled to draw upon them to some extent in recent studies of his upon the Phasmidae[2], Acrididae[3], Tettigoniidae[4] and Gryllidae[5] of Colombia and Panama. In a recent paper on Neotropical Blattidae, I have recorded the assembled Costa Rican series of the genus *Litopeltis*, describing a number of new species from that country, as well as a new genus related to *Litopeltis*[6] and a new Costa Rican species of *Pseudomops*. Mr. Hebard has also drawn upon these series in a recent study of the grylline group Luzarae.[7]

The present paper presents certain very striking new locusts from Costa Rica, among them being forms which require the description of two new genera, as well as the detailed definition of another genus not clearly diagnosed in previously published literature. Reviews of three genera, in which all the known species are discussed and keys presented, have been included to make the work on the respective genera complete to date. Two previously known genera are here recorded from north of Panama for the first time, one of these (*Nicarchus*) being known in the literature only from the original Stålian reference of the seventies.

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[1] Volume XLVII, pp. 307-318, pl. 17.

[2] Trans. Am. Ent. Soc., XLVIII, pp. 327-362, pls. 14-15, (1923).

[3] Trans. Am. Ent. Soc., L, pp. 75-140, pls. 6-8, (1924).

[4] Trans. Am. Ent. Soc., LIII, pp. 79-156, pls. 18-21, (1927).

[5] Trans. Am. Ent. Soc., LIV, pp. 79-124, pls. 14-17, (1928).

[6] Trans. Am. Ent. Soc., LIV, pp. 125-194, pls. 18-21, (1928).

[7] Trans. Am. Ent. Soc., LIV, pp. 1-56, pls. 1-13, (1928).

In the present paper the following are treated: *Ophthalmolampis bradleyi* new species; *Lithoscirtus miniatulus* (Rehn), *L. viceitas* new species, *L. daedalus* new species, *L. bimaculatus* (Rehn), *L. nebulicola* new species, *L. ovatipennis* (Rehn); *Guetaresia lankesteri* new genus and species; *Nicarchus enyalius* new species; *Microtylopteryx fusiformis* Rehn, *M. fusiformis lamprus* new subspecies, *M. talamancae* new species, *M. tristani* new species, *M. hebardi* Rehn, *M. nigrigena* Hebard; *Hylopedetes* new genus, *H. mirandus* new species, *H. cruentus* new species, *H. gemmeus* new species.

Ophthalmolampis bradleyi new species (Plate I, figs. 1-4, II, fig. 1.)

A very striking new species of the genus, apparently more nearly related to *O. cinctipennis* Stål,[8] from Peru, and *geniculapicta* Bruner,[9] from Bolivia, than the other known forms. It agrees with the above mentioned species in having greatly abbreviate tegmina, which do not overlap mesad, but the species is at once separable from *cinctipennis* by the striking red, yellowish white and blackish barred livery of the tegmina and the gamboge yellow genicular region of the caudal femur, which area is outlined proximad by a narrow blackish annulus. Stål's *cinctipennis* is known only from the male sex, so structural comparisons are necessarily limited, as his description is quite brief. From Bruner's *O. geniculapicta* the present species differs principally in its smaller size, the lack of distinct pale longitudinal lines on the sides of the pronotum, the absence of orange maculae from the genicular region of the caudal femora, in the caudal metatarsus being appreciably shorter than the second or third tarsal joints, in the tegmina having but one whitish longitudinal line and also in the color of the antennae, face and caudal tibia.

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[8] Bihang K. Svenska Vet. Akad. Handlingar, v, no. 4, p. 87, (1878). [♂; Peru.]

[9] Annals Carneg. Mus., XIII, p. 39, (1919). [♀; Provincia del Sara, Bolivia.]

This is the first species of the genus to be known from Central America. It is very probable that when more of the species which are still considered to belong to this genus are available for comparative study, it will be found they represent more than one genus. The form of the ovipositor jaws and of the supra-anal and infra-cercal plates show distinct differences in the species now in hand, but too small a proportion of those described are before me for definite deductions along these lines.

Type.—♀; Suretka Trail, between the Sixaola and Estrella Valleys, Costa Rica. May 19, 1924. (J. Chester Bradley.) [Academy of Natural Sciences of Philadelphia, Type no. 5444.]

Size relatively small for the genus; form robust, markedly brachypterous; surface of head, pronotum, pleura and dorsal and ventral surfaces of caudal femora largely impresso-punctate; ovipositor jaws and limbs, but particularly caudal tibiae and tarsi, pilose.

Head short, broad, transverse as seen from dorsum: occiput and postocular portion of the genae subinflated as usual in the genus, in profile the former is appreciably convex, distinctly declivent cephalad through the marked interocular narrowing to the subhorizontal dorsal surface of the fastigium: fastigium as seen from dorsum quite short, hardly longer than interocular narrowing of vertex, transverse, truncate cephalad, lateral margins in same aspect appreciably but not strongly diverging caudad; dorsal surface of fastigium medio-longitudinally sulcate for the cephalic two-thirds of its length; in profile the fastigium is seen to be interantennal in position, rounded obtuse-angulate dorsad at fastigio-facial angle and ventrad passing regularly into the distinctly retreating face: in cephalic aspect the brief frontal costa is limited to the short area between the fastigio-facial angle and a point immediately ventrad of the median ocellus, slightly narrowing ventrad, punctato-sulcate about and for a short distance dorsad of the ocellus. Surface of entire face and adjacent portions of genae, extending to ventro-caudal angles of latter, deeply and cribrosely cicatricoso-punctate, relatively large paired ocelliform areas flanking the median ocellus, accompanied ventrad by slightly larger, somewhat more lateral, semicircular paired rounded elevations of similar type.

Eyes full, moderately prominent, subovoid in basal outline, this subdeplanate cephalad, dorso-ventral depth slightly greater than twice that of infra-ocular portion of genae, the eyes at vertex virtually subcontiguous, separated only by an occipital area narrower than the narrowest antennal joint. Antennae elongate, three-fourths as long as body, distad of proximal joint slender, articles distad of seventh individually markedly elongate.

Pronotum short, subquadrate in dorsal aspect, appreciably sellate, in profile very narrowly ascending cephalad and faintly more so caudad; medio-dorsal length of pronotum equal to slightly more than one and one-half times the exposed dorsal length of head (as 11 to 7), greatest dorsal width across metazona subequal to pronotal length: cephalic margin of disk moderately but broadly produced, as a whole there low arcuate, mesad shallowly concave-emarginate; caudal margin moderately arcuate, this margin rather heavily cingulate: four distinct transverse sulci indicated, the second the shallowest, the third and fourth quite broadly and the latter quite deeply impressed; the third bisects the median line of the disk at its middle, the fourth crosses slightly cephalad of the middle of this caudal half: region of the lateral carinae between the transverse sulci with subinflated smooth rounded bosses, one occupying the section between the first and third sulci, the second not bisecting it, the other between the third and fourth sulci: surface of discal metazona as a whole slightly elevated dorsad of the remainder of the disk; all of surface of disk except of the smooth bosses above mentioned heavily impresso-punctate, thickly and cribrosely so on the metazona. Lateral lobes of pronotum subequal in dorsal length and depth; cephalic and caudal margins slightly converging ventrad, ventro-cephalic angle obtuse, ventro-caudal angle broadly arcuate; ventral and caudal margins appreciably cingulate: surface of lateral lobes for two-thirds of their depth with continuations of first, third and fourth transverse sulci of disk markedly indicated; metazona entirely and ventral portion of prozona impresso-punctate, cribrose on the metazona.

Tegmina abbreviate, lobate, lateral, sublanceolate in shape; in length about one and one-fourth times that of the pronotal dorsum, greatest width of tegmina contained two and one-sixth times in greatest length of same: costal margin strongly arcuate proximad, more gradually so distad; sutural margin regularly and moderately arcuate; apex narrowly oblique subtruncate: surface of tegmina moderately polished, of sutural half subobsoletely impresso-punctulate, of costal half smooth, the broad area of the usual humeral trunk subinflated compared with the immediate costal section. Wings not evident.

Abdomen subcompressed, dorsum distinctly carinulate mediolongitudinally for much of its length. Tenth abdominal tergite moderately elongate, acute trigonal in shape, the apex very narrowly rounded, the lateral sections distinctly deflexed, subvertical, the dorsal surface subequally deplanate in proximal half. Cerci simple, styliform, tapering. Infra-cercal plates reaching to apex of tenth tergite, obliquely subtruncate distad, the surface there briefly sub-shagreenous. Ovipositor valves of moderate length, compressed and narrow; dorsal pair faintly incurved at tips, dorso-lateral margins obsoletely serrulate; ventral pair distinctly thinner than dorsal pair, appreciably arcuate in profile, tips weakly decurved, margins unarmed. Subgenital plate large, sublanceolate as seen from venter, which surface is subdeplanate; lateral margins of venter subcarinate, subparallel proximad, thence converging arcuately to narrowly rounded tip; lateral portions of plate vertical, forming right angles with ventral surface, their dorsal margin sigmoidally descending distad to the plane of the ventral surface of the plate.

Prosternal production broad and heavy, conical, subtransverse as seen from venter, cephalic surface heavily cribroso-rugose. Area of meso- and metasterna distinctly deplanate; mesosternal lobes separated by a slightly transverse subquadrate interspace, narrowly widening caudad; metasternal lobes narrowly contiguous.

Cephalic and median limbs relatively short, the femora rather heavy and subarcuate. Caudal femora robust, appreciably inflated, greatest depth contained three and one-half times in length of same; dorsal carina distinctly spaced serrulate; genicular lobes with their distal angle sharply acute, ventral margin of lobes strongly obtuse-angulate expanded. Caudal tibiae with eight spines on each margin, one on each side being apical. Caudal tarsi elongate, equal to three-fourths the tibial length, the second and third joints subequal in length, the first (metatarsus) not more than two-thirds the length of either of the others; the first (metatarsus) relatively broad, subdepressed, bearing three pulvilli, the second joint subcylindrical with a short apical pulvillus, from which extends proximad a distinct elevated carinulation, the third joint quite slender proximad, enlarging distad; tarsal claws strongly hooked; arolia large.

General color of pronotum, pleura, abdomen, ventral surface and limbs kildare green to light cress green (Ridgway), deeper on the dorsum of the pronotum, cephalic and median limbs and caudal femora than elsewhere. Head with face, fastigium and cephalic section of genae pale nopal red, darkening to dull carmine on the mouth-parts; occiput dull bay, passing to dark greenish olive caudad on the genae; two pairs of narrow, longitudinally diverging, postocular opaque white lines present, well separated, the dorsal one horizontal in position, the ventral one ventro-caudad declivent. Eyes auburn; antennae dark slate blue, each segment narrowly annulate distad with sulphine yellow (proximad on antennae) to apricot yellow (distad), the proximal joint largely sulphine yellow dorsad, slate blue ventrad. Pronotum weakly washed with pale apricot yellow in the general region of the lateral shoulders between the sulci on the prozona; a pair of small, opaque white, ovate spots placed on the line of the dorsal postocular line of the head and immediately caudad of the first transverse sulcus. Tegmina nopal red (Ridgway) longitudinally and contiguously bilineate mesad, on costal side broadly with opaque white, with a faint greenish tinge, on sutural side more narrowly with blackish fuscous, the latter not reaching to the tegminal bases; nopal red of costal margin equal in width to blackish fuscous band, of sutural side equal to both the costal red belt and white band in width. Cephalic and median tarsi with two proximal joints honey yellow, remainder of general color of limbs. Caudal femora having five or six very small dots of blackish brown mesad on dorso-internal faces and two similar dots proximad on lateral face; distal extremity dull primuline yellow ventrad, becoming weak ochraceous-tawny on the genicular arches, whole genicular region cut off from base color of the remainder of the femur by a narrow undulate annulus of blue-black, which color also margins the genicular lobes distad and the distal margin of the arches, as well as lining the proximo-ventral section of the caudal tibiae; latter immediately proximad dull primuline yellow, becoming kildare green then gradually passing distad to ivy green, spines black tipped; caudal tarsi chrysolite green externally, brownish olive internally.

Length of body, 23.5 mm.; length of pronotum, 4.6; greatest width of pronotum, 4.4; length of tegmen, 5.6; greatest width of tegmen, 2.9; length of caudal femur, 12.7.

The type of this beautiful species is unique. I take pleasure in dedicating it to my old friend and colleague, Dr. J. Chester Bradley, of Cornell University, who collected the type.

LITHOSCIRTUS Bruner

1905. *Dellia* Rehn, Proc. Acad. Nat. Sci. Phila., 1905, p. 422. (Not *Dellia* Stål, 1878.)

1908. *Lithoscirtus* Bruner, Biol. Cent.-Amer., Orth., II, p. 273.

Originally studied by me without the advantage of material of the West Indian genus *Dellia*, three of the species here discussed were referred to that genus on account of their agreement with it as diagnosed in Stål's tables. Bruner in the Biologia listed them under *Dellia*, but states under the species *miniatula*, the only one before him: "This locust was common * * *. The mature males were so lustrous and gem-like as to suggest the generic name *Lithoscirtus* to the present writer, who had not then recognized Stål's genus *Dellia*."

With material of true *Dellia* before me, including the genotype *D. insulana*, from Cuba, it is evident the Central American assemblage is generically distinct, although the relationship is more intimate with *Dellia* than with any other genus.

It seems unfortunate that we must use Bruner's inadvertently mentioned new generic name, but although without description, figure or definite proposal as a generic entity, the name *Lithoscirtus* appears valid from the Biologia. The genotype must of course be *Dellia miniatula*, the species under which *Lithoscirtus* was used and the only one known to Bruner.

The present genus can be distinguished from *Dellia* by the more produced, less transverse fastigium, which is also distinctly more horizontal and less declivent than in *Dellia;* in the head, aside from the eyes, being narrower, more compressed and with the face less deplanate; in the face lacking distinct lateral carinae, instead of having them pronounced as in *Dellia;* in the eyes being distinctly globose and inflated; in the median carina of the pronotum being obsolete; in the prosternum being very bluntly conical, without an erect tubercle as in *Dellia*.

The general form of *Lithoscirtus* is more slender, lighter and less rhicnodermoid than *Dellia*, the head less transverse, the eyes not as reniform in outline and not as strongly directed mesad when seen from the dorsum. The limbs are more elongate and slender, particularly the cephalic and median pairs.

Generic Characters.—Body fusiform, subapterous or tegmina at most but lateral ovate pads. Surface shining. Head with eyes prominent, subglobose. Fastigium subproduced, trigonal, truncate at apex in dorsal view, from interocular constriction longer than broad or length and breadth subequal, subhorizontal, below plane of subglobose occiput; narrowly and finely sulcate mediolongitudinally; ocular interspace at vertex very narrow, never as great as width of truncate apex of fastigium; interantennal production in profile subtruncate distad, fastigio-facial junction nearly rectangulate; face appreciably retreating, no frontal costa ventrad of antennae and no true supplementary facial carinae present;[10] interantennal production non-sulcate cephalad. Antennae elongate, slender, filiform, the articles individually elongate except for the enlarged proximal one. Pronotum sellate, regularly arcuate dorsad in transverse section, median carina obsolete or indicated but weakly, no lateral carinae present, transverse sulci deeply impressed; caudal margin of disk subemarginato-truncate to distinctly emarginate; metazona from a half to less than a third as long as the prozona; dorsal and lateral surfaces of metazona impresso-punctulate. Tegmina minute, little evident slips to ovate, net-veined pads reaching to caudal margin of median segment. Prosternum broadly inflated, non-tuberculate, to the same with mesad a low and blunt cone. Apex of male abdomen strongly recurved or subrecurved; male cerci erect, moderately incurved, sub-caliperlike. Ovipositor valves of female very narrow, elongate, styliform, unarmed. Cerci of female broad at base, acute styliform. Limbs elongate, slender, smooth; caudal femora reaching to or surpassing apex of abdomen, paginal pattern of caudal femora regular and marked, margins of caudal femora unarmed, genicular lobes of caudal femora acute to subacute; caudal tibiae with no external apical spine, six spines on external margin.[11] Caudal tarsi elongate, first joint (metatarsus) subequal to or but slightly longer than second, the two together nearly or quite equal to third joint, in length. Arolia present. Tarsal claws equal.

Genotype: *Lithoscirtus miniatulus* (Rehn) [*Dellia miniatula*].

The species known to me referable to this genus are *L. miniatulus* (Rehn),[12] *L. bimaculatus* (Rehn),[13] *L. ovatipennis* (Rehn)[14] and *L. viceitas, daedalus* and *nebulicola* here described.

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[10] The face of *L. nebulicola* shows low callose areas in the usual situation of the facial carinae. None of the other species show any trace of similar elevations.

[11] A single specimen of *L. daedalus* and two of *L. nebulicola* possess a single additional more proximal spine on the external margin of one tibia, which is clearly an adventitious feature. Similarly a male of *L. bimaculata* has one of the usual spines suppressed, bearing but five externally.

[12] *Dellia miniatula* Rehn, Proc. Acad. Nat. Sci. Phila., 1905, p. 423, figs. 22 and 23, (1905). [♂, ♀; Carrillo, Costa Rica.]

[13] *Dellia bimaculata* Rehn, Proc. Acad. Nat. Sci. Phila., 1905, p. 426, figs. 25 and 26. [♂, ♀; Carrillo, Costa Rica.]

[14] *Dellia ovatipennis* Rehn, Proc. Acad. Nat. Sci. Phila., 1905, p. 428, figs. 24 and 27. [♀; Carrillo, Costa Rica.]

Having personally collected all the species here referred to the genus I am well acquainted with their habits. All except *L. ovatipennis* are forms of the heavy forest, although *L. nebulicola* was taken on recently cleared forest land adjacent to extensive areas of solid forest, from which I feel it originally came. In the "sunlight holes" which break the twilight of the heavy forest, *Lithoscirtus* will be found as an undergrowth foliage frequenter, basking in the sunlight filtering down through openings in the leaf canopy. The species are all exceedingly active, and with the greatest agility can, in a succession of bounds, quickly place themselves out of the way of harm. Their coloration is gem-like in life and to me they form one of the most interesting groups of tropical Acrididae.

The following key is essentially artificial, being given merely to aid in the separation of the species, the natural arrangement of which, I think, is the sequence in which they are treated.

Key to the Species of Lithoscirtus

A. Tegmina represented only by minute slips, not reaching, or at most not appreciably surpassing, caudal margin of mesonotum.

  B. Caudal femora more elongate, appreciably attenuate in the pregenicular area. Pronotum proportionately more elongate sellate. Auditory tympana larger, with greatest dimension equal to one-half of length of median segment. Apex of male abdomen clavate and strongly recurved; cerci heavy, compressed, short, flexed mesad at tips. Dorsal surface of abdomen, exclusive of apex, not uniformly greenish. Cerci of male uniformly blackish. Tenth sternite of male when marked with pale having same undivided.

    C. Cerci of male proportionately broader and heavier, the lateral aspect subequal in width in at least proximal half. Median femora largely bright crimson. Face and genae in both sexes pale olive-green and black. Paired pale spots caudad on pronotal disk pale greenish. Apex of male abdomen (i. e. tenth sternite) marked with pale greenish; dorsal surface of abdomen of male with segmental paired pale greenish spots on a blackish ground.

D. Cerci of male with distal mesad reflexed area a narrow lamellate edge, as seen from dorsum with internal margin arcuate. Limbs in both sexes proportionately more elongate, more slender, particularly the femora, and especially the caudal femora.
miniatulus (Rehn)

DD. Cerci of male with distal mesad reflexed area a decided, acute lobe, as seen from dorsum its margins straight oblique cephalad, arcuate caudad, the reflexed area strongly deplanate as seen in caudal aspect. Limbs in both sexes proportionately heavier, particularly the femora, and especially the caudal femora........................*viceitas* new species

CC. Cerci of male more tapering, in lateral aspect distinctly and regularly narrowing in proximal three-fourths. Median femora without crimson. Face and genae entirely black in male, narrowly olive-green ventrad of the eyes in female. Paired pale spots caudad on pronotal disk straw-colored. Apex and dorsal surface of abdomen of male solidly black.
daedalus new species

BB. Caudal femora more robust, less attenuate in the pregenicular area. Pronotum proportionately broader sellate. Auditory tympana smaller, with greatest dimension equal to no more than one-third of length of median segment. Apex of male abdomen moderately clavate but less recurved than in alternate; cerci elongate, more tapering, subfalcate in profile, gently curved mesad at tips. Dorsal surface of abdomen, exclusive of apex, uniformly greenish. Cerci of male bicolored. Tenth sternite of male with large, paired, subcircular pale spots.
bimaculatus (Rehn)

AA. Tegmina developed as ovate pads, at least two-thirds as long as pronotal disk, reaching to middle (*ovatipennis*) or caudal margin (*nebulicola*) of median segment.

B. Tegmina coriaceous, with network venation uniformly marked over tegminal surface; tegminal form subspatulate. Caudal femora more tapering, pregenicular region proportionately slenderer. (Apex of male abdomen appreciably recurved; cerci erect, not bent mesad, narrower distad than proximad, ventral margin with a distinct shoulder slightly distad of middle.)
nebulicola new species

BB. Tegmina subcorneous, with entire costal half of same polished, the venation in that area obsolete; tegminal form elliptical. Caudal femora more robust, less strongly

tapering than in alternative, pregenicular region proportionately more robust. (Male unknown.)
ovatipennis (Rehn)

ithoscirtus miniatulus (Rehn) (Plate IV, figs. 1, 5, 8.)

905. *Dellia miniatula* Rehn, Proc. Acad. Nat. Sci. Phila., 1905, p. 423, figs. 22 and 23. [♂, ♀; Carrillo, Costa Rica.]

908. *Dellia miniatula* Bruner, Biol. Cent.-Amer., Orth., II, p. 273. [Carrillo and Juan Viñas, Costa Rica.]

My sole purposes in discussing here the previously known pecies referable to *Lithoscirtus* are to show their relative posiions, where necessary to indicate their single types, and to lace on record the localities and material in the relatively exensive series of the genus before me. At a later date I will nalyze more fully these series for variational data of noteworthy character, and also place on record the binomic obserations which I have made. The present species was described rom a type pair, taken at Carrillo, presumably by Underwood, nd I here designate the male of the same (Hebard Collection, Type no. 324) as the lectotype, or selected single type.

The following series of *L. miniatulus* are now before me:

Carrillo, Costa Rica. June, 1903 (on one specimen). (Underwood.) Four males, eight females, *type, allotype* and *paratypes.* Hebard Cln. and A. N. S. P.]

La Emilia, near Guápiles, Costa Rica. August 12-24, 1923; September 12, 1927. (Rehn.) Three males, three females, one mmature male, one immature female. [A. N. S. P.]

Juan Viñas, Costa Rica. March, 1902. (Bruner.) Six males, ight females, three immature males. [Hebard Cln. and A. N. S. P.] September 29, 1909. (P. P. Calvert.) One female. [A. N. S. P.]

Pózo Azúl [de Pirrís], Costa Rica. May, 1902 (on four). (M. A. Carriker, Jr.) Three males, three females. [Hebard Cln. and A. N. S. P.]

From personal knowledge of the species and its occurrence at ocalities where I have collected, I am strongly inclined to quesion the accuracy of the labelling of the Pózo Azúl material. This locality is at a low elevation on the Pacific side of Costa Rica, far removed from the other localities where the species has been taken. I made a rather arduous trip to Pózo Azúl n 1927 and spent some days there, in fact in the immediate environment in which Mr. Carriker worked, and while many types of Orthoptera of Atlantic relationship were found, not a single member of this genus was seen, although it was taken earlier and later on the Atlantic slope. My final notes particularly call attention to the absence of this genus and *Microtylopteryx,* which is frequently associated with *Lithoscirtus.* A portion of the Pózo Azúl material came to us from Bruner already labelled, the other specimens were labelled in Philadelphia from the rough label on a lot, from which presumably the first specimens had been taken. I cannot help feel but that in some way, probably by confusion of lots, a representation from an Atlantic side locality was roughly labelled as from Pózo Azúl. These specimens of *Lithoscirtus* are smaller than individuals from Carrillo and La Emilia, but agree very well in size with the Juan Viñas representation.

Lithoscirtus viceitas[15] new species (Plate III, fig. 3, IV, figs. 2, 6, 9.)

This species is closely related to *L. miniatulus,* which it probably replaces in the lower Talamancan country as well as in the cloud forest region of the higher Talamancan 'Cordillera. It differs from *miniatulus* chiefly in the somewhat heavier and stockier limbs, particularly the femora and more especially the caudal femora, which are appreciably less attenuate in both sexes than they are in *miniatulus,* and in the cerci of the male having the distal section sharply rectangulately flexed mesad and produced into a decided acute cusp, which gives the paired cerci a caliper-like appearance, this distal area also being sharply deplanate dorsad, quite different from the shape of the same area in *miniatulus.*

Type.—♂ ; Suretka Trail, between the Sixaola and Estrella Valleys, Limón Province, Costa Rica. May 19, 1924. (J. Chester Bradley.) [Academy of Natural Sciences of Philadelphia, Type No. 5169.]

General size, form and proportions as in *L. miniatulus.* The following features are those of evident difference from *miniatulus,* which was originally described in detail (see reference above).

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[15] From the Viceitas, aboriginal inhabitants of Talamanca.

Pronotum with the ventral margin of the lateral lobes sigmoid as in *miniatulus,* but the arcuation caudad of the cephalic concavity is regularly convex and not subangulate then obliquely arcuato-truncate as in *miniatulus.*

Cerci in lateral profile distinctly narrower than in *L. miniatulus,* subdeplanate on external face of proximal half, which has its cephalic and caudal margins parallel, in profile these regularly arcuate converging thence and meeting to form the caudal margin of the inflexed, deplanate, subfalcate distal portion of the cercus; in caudal aspect the cerci are sharply and rectangularly inflexed faintly distad of the middle, subdeplanate externally in proximal half, concave internally as a whole, distal section as seen in caudal aspect a dorsad sharply deplanate lamellation; in dorsal aspect (i. e. of distal portion of cerci, not abdomen with recurved apex) the cerci have the mesad directed lamellation broad, straight cephalad, strongly arcuate caudad, acute at apex, its surface shallowly impressed within a narrow cingulation of the arcuate margin. In proportions the deplanate mesad-directed distal section is subequal in length to that of the external face of the vertical portion of the cercus.

Limbs proportionately more robust than in *miniatulus,* particularly the femora and especially the caudal femora. The latter are less regularly tapering, and have the ventral margin more appreciably convex, while their greatest width compared with the femoral length is proportionately more (as 25 to 113 against 23 to 110 in *miniatulus*).

Allotype.— ♀ ; North end of Suretka Trail, along Duroy River, Estrella Valley, Limón Province, Costa Rica. Elevation, 100-150 feet. September 8, 1927. (Rehn; on foliage in dense forest.) [Academy of Natural Sciences of Philadelphia.]

Differing from the same sex of *miniatulus* in the proportionately more robust caudal femora, as in the male sex, although slightly less decided. Cerci more slender proximad, and appreciably more elongate and attenuate distad than in *miniatulus.*

The color pattern and tones of *L. viccitas* are exactly as in *L. miniatulus* except for the slight differences here noted. As these features of *miniatulus* have been described in detail[16] no necessity exists for what would be almost entirely a repetition. The pale color of the head in well preserved specimens of *viccitas* is less greenish and more light russet-vinaceous or avellaneous to drab gray than in *miniatulus.* The pale areas of the dorsum of the pronotum and abdomen are also less greenish and more drab to light slate gray than in the previously known species.

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[16] See Proc. Acad. Nat. Sci. Phila., 1905, p. 423.

Measurements (in millimeters)

	Length of body	Length of pronotum	Length of caudal femur
♂, Suretka Trail, *type*..........	13.1[17]	2.85	9.2
♀, Suretka Trail, *allotype*.......	17	3.1	10
♀, Ujarrás de Térraba..........	17.2	3.27	11.1

In addition to the type and allotype I have before me the following specimens:

Suretka, Sixaola Valley, Limón Province, Costa Rica. May 31, 1924. (J. C. Bradley.) One female in the instar preceding maturity. [A. N. S. P.]

Ujarrás de Térraba, Cordillera de Talamanca, Costa Rica. September 10, 1907. (M. A. Carriker, Jr.) One male in the instar preceding maturity, two adult females. [Hebard Cln.]

Although the male from Ujarrás de Térraba is not quite adult, the distinctive form of the cerci of that sex is fully evident. Its limb proportion are also those of *viceitas*. The females from the same locality have the limbs and cerci fully agreeing with the allotype.

It is evident from these localities that *viceitas* has a wide vertical range, or from the heavy Talamancan forests virtually at sea-level (Suretka Trail) to a rain and cloud soaked mountain forest at 7000 to 8000 feet (Ujarrás de Térraba[18]).

Lithoscirtus daedalus[19] new species (Plate III, fig. 1, IV, figs. 3, 7, 15.)

A member of the *miniatulus* group of the genus and nearly related to *L. miniatulus* and *viceitas*, from both of which it differs in the less recurved and less clavate apex of the abdomen in the male sex; in the cerci in the same sex regularly narrowing distad when seen in profile, while the sharply mesad reflexed distal portion of the same, which suggest that of *L. viceitas*, has the cephalic margin arcuate and the caudal straight, instead of the converse as in *viceitas;* in the absence of crimson from the median femora and in the face being entirely black in the male and narrowly olive-green ventrad of the eyes in the female; in the apex and dorsal surface of the male abdomen being solidly black and the paired pale spots caudad on the pronotum straw-colored instead of pale greenish. The caudal femora are as slender proportionately as in *miniatulus* and less robust than in *viceitas.*

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[17] This measurement in the male is necessarily taken in a straight line to that point of the abdomen most caudad when the apex of the abdomen is in its normally recurved position.

[18] See Carriker, Annals Carneg. Mus., VI, pp. 356-357, (1910).

[19] From δαί᾽δαλος *artful*, in relation to the ability of the species of *Lithoscirtus* to dodge and jump.

The chief impression one receives of this striking species is of the generally blackish color of the dorsal surface of the male, while in the female broad lateral areas much darker and more solidly colored than in the related species, at once catch the eye.

Type.— ♂ ; Navarro, Costa Rica. Elevation, 3800-3950 feet. July 24, 1927. (C. H. Lankester and J. A. G. Rehn; on foliage of broad leafed plant in heavy forest.) [Academy of Natural Sciences of Philadelphia, Type no. 5463.]

Form as in *L. miniatulus* and *viceitas,* slightly more robust. Body with even more numerous sparse and scattered hairs than in the above species.

Head in cephalic aspect with the eyes less exserted and less globose dorsad, interocular space at base of fastigium very narrow, hardly equal to the width of the average antennal joint: fastigium in dorsal view acutely trigonal, with apex narrowly transverse truncate, much more narrowly so than in *miniatulus,* dorsal surface of fastigium with a few impressed punctulae and a fine but distinct medio-longitudinal sulcation. which ends cephalad in a small semicircular impressed area; in lateral aspect the fastigio-facial angle is obtuse-rectangulate, the interantennal production of the frontal costa slightly more arcuate in profile than in *L. miniatulus.* Antennae greatly elongate, lacking tips in type, of the same character as in *L. miniatulus.*

Pronotum as in *L. miniatulus.*

Tegmina minute ovate pads, as in *L. miniatulus,* surpassing caudal margin of mesonotum by about a third the tegminal length.

Mesonotum, metanotum and proximal tergite of abdomen appreciably smoother and less impresso-punctulate than in *L. miniatulus.* Auditory foramina of proximal tergite more ovate and less circular than in *L. miniatulus.*

Apex of abdomen strongly recurved, subclavate, in profile its general outline is much as in *L. miniatulus,* but the surface of the recurved sternites is smoother, less punctulate. The eighth sternite is somewhat larger; the ninth more strongly rectangulate than in *L. miniatulus*, while the tenth is somewhat more compressed and longer in proportion.

Cerci in lateral view short, the margins regularly converging distad, at the dorsal point truncate by the deplanation and mesad flexure of the distal portion of the cercus; in caudal aspect the distal portion of the cercus is seen to be rectangulate deflexed mesad as in *L. viceitas*, but the distal portion is different in character and the internal surface is less regularly concave and more rectangulate; in dorsal aspect the distal portion of the cercus is seen to have its surface shallow concavo-excavate, the caudal margin is straight, the cephalic is arcuate with the apex acute, the general form of this area thus distinctly different from that of *L. viceitas*.

Cephalic and median limbs more robust than in *L. miniatulus* or *viceitas*, particularly the femora which are distinctly stouter when seen from dorsum. Caudal femora as in *L. miniatulus*, less robust than in *L. viceitas*. Caudal tibiae and tarsi as in *L. miniatulus*.

Allotype.— ♀ ; same date as type. [Academy of Natural Sciences of Philadelphia.]

The female sex agrees with that of *L. miniatulus* except for the notheworthy differences here given.

Size slightly larger.

Eyes faintly less globose dorsad: fastigium in dorsal view as in the male sex narrower and more acutely trigonal with the apex distinctly narrower, sculpture of same surface as in the male sex, except that distal impressed area is obsolete; in lateral aspect the dorsal surface of the fastigium is more distinctly declivent cephalad, the fastigio-facial angle is slightly more obtuse and the inter-antennal production of the frontal costa is more arcuate in profile, as in the male.

Auditory formina differing in shape as in the male sex.

Apex of abdomen as in *L. miniatulus* and *viceitas* except that the distal margin of the ultimate sternite (subgenital plate) is less sharply concave acute-angulate, with the tongue-like production lying between the ventral ovipositor valves shorter and less differentiated from the more lateral portions of the margin itself. Cerci as in *L. miniatulus*, slightly shorter and broader than in *L. viceitas*.

Cephalic and median limbs slightly more robust than in *L. miniatulus*.

Base pale color ranging from dull olive-citrine to dull aniline yellow, on the limbs passing to olive green or even cerro green (Ridgway) in the more contrasted specimens. The dark overlying color is fuscous black, in certain lights occasionally with a blue-black tendency, mantling much of the surface and greatly reducing the area of the pale color when compared with the other species of the genus. In an average male specimen (paratypic male) the dark overlay covers all of the head except the eyes, the proximal portion of the antennae, all of the pronotum except for a pair of quadrate pale areas on the metazona at the lateral shoulders and reaching from the principal sulcus to the caudal margin, the dorsal half of the pleura, the dorsal and ventral but not lateral surfaces of the abdomen, and the entire apex of the same. In the type, which is more intensively colored, the eyes are darker, the contrast with the pale areas is less evident as the latter are darker, the pale metazonal paired spots are narrower, the paler sides of the abdomen less contrasted, the dorsal surfaces of the cephalic and median femora and the same pairs of tibiae washed with the darker color. In the female sex more of the pale color is evident, there being infra-ocular dashes in addition to the areas given for the male, while the dorsum of the fastigium and center of the occiput is pale olivaceous with a broad medio-longitudinal thoracic bar, continued more narrowly on the abdomen, on tergites six and seven extending ventrad and joining the lateral paler area. In the female the apex of the abdomen is not solidly dark as in the male, the ovipositor valves and cerci being bicolored, and the distal sternite may (allotype) or may not be marked with the paler color. The eyes range from auburn (paratypic male) to very deep chestnut-brown (type). The antennae are narrowly white-tipped, the remainder washed with blackish fuscous to an extreme condition which makes all but the pale tips of that shade. No trace of red is seen on limbs. Caudal femora with the greenish color clear, unmarked, dull in type specimen, more brilliant in others; caudal tibiae ranging from bluish gray-green to dark bluish gray-green, proximad passing to the femoral color, spines ochraceous, dark tipped; tarsi of the color of most of the limbs, arolia at least in part dark.

Measurements (in millimeters)

	Length of body	Length of pronotum	Length of caudal femur
♂, *type*	16.2[20]	2.72	9.4
♀, *allotype*	18.3	3.1	10.6

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[20] This measurement is taken as in the male sex of *L. riccitas*, i. e. from apex of fastigium to most caudal point of abdomen with the apex of the latter in the more recurved position.

In addition to the type and allotype I have before me a paratypic male and female and three immature females in the instar preceding maturity, bearing the same data as the type, and in the collection of the Academy. The other adults show no features of difference from the described specimens.

All the specimens of this interesting species seen at Navarro were taken, and it is known from no other locality. It was recognized as new when taken and careful search was made for additional individuals. My notes specifically mention the distinct metallic sheen of the abdomen of the female in fresh material, which is entirely lost in the dried specimens.

Lithoscirtus bimaculatus (Rehn)

1905. *Dellia bimaculata* Rehn, Proc. Acad. Nat. Sci. Phila., 1905, p. 426, figs. 25 and 26. [♂, ♀; Carrillo, Costa Rica.]

Of the original type pair of *bimaculatus*, presumably collected by Underwood, I here select the male (Hebard Collection, Type no. 325) as the lectotype.

The following series of *bimaculatus* are now before me:

Carrillo, Costa Rica. Three males, three females, *type, allotype* and *paratypes*. [Hebard Cln. and A. N. S. P.]

Guápiles, Costa Rica. (William Schaus.) One male. [U. S. N. M.]

La Emilia, near Guápiles, Costa Rica. August 14-24, 1923; September 15, 1927. (Rehn.) Two males, three females, one immature male, seven immature females. [A. N. S. P.]

Rio Maria Aguilar, near San José, Costa Rica. Elevation, 3620 feet. August 30, 1923. (Tristán and Rehn.) One immature male. [A. N. S. P.]

Lithoscirtus nebulicola[21] new species (Plate I, fig. 5, III, fig. 2, IV, 4, 10.)

More nearly related to *L. bimaculatus* and *ovatipennis* than to *L. miniatulus, viceitas* or *daedalus*. From *bimaculatus* it differs in the presence of distinct, though lateral and spatulate, tegmina, in the less projecting fastigium (as seen in profile), in the proportionately longer metazona of the pronotum, in the more elongate limbs, the long ovipositor jaws, the form of the male cerci and certain features of the coloration, the more evident of which are the lack of the pair of pale spots found caudad on the metazona of the pronotum in *bimaculatus,* and in the male subgenital plate bearing one large median pale spot, instead of a larger bilobate spot. From *ovatipennis, nebulicola* differs most strikingly in the greater size, more elongate antennae, in the pronotum being more compressed cephalad, in the more elongate and spatulate tegmina, the more elongate limbs, generally more rugulose and punctulate chitin, and certain color features, as the difference in the pattern of the pronotum and tegmina. The male sex of *L. ovatipennis* is not known.

Type.—♂ ; La Palma, between the volcanoes of Irazú and Barba, Costa Rica. Elevation, 4960-5100 feet. September 1, 1923. (J. Fidel Tristán and J. A. G. Rehn; in low vines and tangle on recently cleared land at edge of mountain forest.) [Academy of Natural Sciences of Philadelphia, Type no. 5445.]

Size large (for genus); form more slender, elongate, less fusiform than in the other species of the genus; surface distinctly polished.

Head with eyes strongly exserted, ovato-globose in lateral view, slightly elevated dorsad of the occiput and distinctly above the very narrow interocular space of the vertex, which is slightly narrower than the cephalic width of the interantennal production, dorso-ventral depth of eye twice that of infra-ocular portion of the genae. Fastigium as seen from dorsum with its length from least interocular width slightly greater (as 11 to 10) than the greatest fastigial width, apex of fastigium abruptly transverse truncate, dorsal surface of fastigium finely medio-longitudinally sulcate except at extreme apex, in profile the fastigium is seen to be but moderately declivent; interantennal (fastigial) production marked when seen in profile, well rounded cephalad, but passing to dorsal line of fastigium by a distinct angle: face in profile markedly retreating; surface of face with a bluntly sulcate frontal costa present ventrad of median ocellus, costa dorsad of ocellus sulcate but for a short distance from latter; sinuate callose areas laterad on face in the usual position of supplementary facial carinae, these delimiting laterad the distinct impression of the face on each side of the frontal costa. Antennae of the elongate, slender type found in all the species of the genus, subequal to body length, the individual joints very elongate mesad, shorter and proportionately more robust distad; proximal joint large in proportion to the others.

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[21] In allusion to the cloud mantle usually present at La Palma.

Pronotum subsellate, hardly broadening caudad, dorsal line nearly straight in profile, hardly narrowed mesad as seen from dorsum: cephalic margin of disk moderately arcuate produced, subemarginate mesad; caudal margin of disk transversely gently bisarcuate through a shallow median emargination: median carina obsoletely indicated by a faint strumosity on the prozona, on the metazona weakly but appreciably indicated: transverse sulci well impressed: metazona half as long as the prozona, its surface impresso-punctulate, a slight indication of the same condition on dorsal surface of the prozona, particularly about and laterad to a degree on the first transverse sulcus.

Tegmina slightly shorter than the pronotum, reaching caudad to the caudal margin of the metanotum, elliptical, greatest width slightly less than half of tegminal length (as 15 to 32), apex rather narrowly rounded; venation made up of an anastomosing network built around sublongitudinal nervures in what would be the discoidal and anal fields.

Abdomen very faintly subtectate proximo-dorsad, non-compressed, apex curved dorsad but not recurved. No furcula present: supra-anal plate scutellate, broad and subequal in proximal third, the margins acutely converging distad from that point, surface subconcave, appreciably elevated laterad, proximal section finely sulcate medio-longitudinally: cerci erect, subcompressed, moderately elongate, distinctly surpassing apex of supra-anal plate, except for a very faint inward curvature at tips they are straight when seen in caudal aspect; in profile the cerci are faintly concave on dorsal margin, relatively broad proximad, narrowing by the ascending ventral margin to faintly distad of middle, where there is a marked rectangulate shoulder, thence distad the cercus is much narrower, subspatulate and rounded at the apex, subdeplanate within; internal surface of body of cercus with an obliquely directed elevated area extending from dorsal base to the shoulder on the ventral margin: subgenital plate relatively short, rounded conical in caudal aspect, the apex with a very small mammillate production at the dorsal margin, in lateral aspect this margin is seen to be gently arcuate.

Prosternal production roundly elevated, bluntly low mammillate mesad. Interspace between the mesosternal lobes subquadrate; metasternal lobes subcontiguous.

Cephalic and median limbs moderately elongate, the femora appreciably inflated, the tibiae of cephalic pair faintly arcuate, of median pair appreciably arcuate. Caudal femora surpassing the apex of the abdomen by about the pronotal length, elongate, of the type usual in the genus, genicular lobes moderately acute; caudal tibiae faintly arcuate in proximal third; caudal tarsi with metatarsus a third longer than second joint (as 20 to 15), third joint but little shorter than first and second together (as 28 to 35).

Allotype.—♀; same data as type. [Academy of Natural Sciences of Philadelphia.]

Differing from the above description of the male sex in the following noteworthy features:

Form slightly more fusiform than in male.

Eyes proportionately smaller, but little elevated dorsad of the occiput, dorso-ventral depth of eye one and one-half times that of infra-ocular portion of the genae. Dorsal surface of fastigium with medio-longitudinal sulcus subobsolete. Face somewhat less retreating than in male; frontal costa merely sparse punctulate immediately dorsad of median ocellus. Antennae somewhat shorter than in male, equal to two-thirds of body length.

Pronotum broadening more appreciably caudad than in the male sex; metazona slightly longer than in male, and equal to somewhat more than half of prozona (as 16 to 29).

Abdomen in large part medio-longitudinally carinato-tectate dorsad. Supra-anal plate acute trigonal, the converging margins gently arcuate, the proximal two-fifths (to the usual transverse depression) medio-longitudinally sulcate, apex finely acute produced: subgenital plate with its distal margin very acutely and subspiniform produced between the ventral valves of the ovipositor, the surface of the plate otherwise transversely arcuate: ovipositor valves elongate, compressed, slender, the dorsal pair somewhat deeper than in the other species of the genus and more resembling the more normal type of acridine ovipositor valve, the dorsal surface of the dorsal valves subconcavo-deplanate, a subcrenulate border laterad separating this surface from the lateral, the dorso-internal margin decided, sublamellate; in profile the dorsal valves are seen to be tapering, acute at apex, ventral valves of the simple, rod-like type seen in the other species of the genus. Cerci short, broad at base, strongly tapering, styliform, apex submammillate.

Interspace between mesosternal lobes transverse; metasternal lobes appreciably separated.

Caudal femora surpassing the apex of the abdomen by about half of the pronotal length.

Measurements (in millimeters)

	Length of body	Length of pronotum	Length of tegmen	Length of caudal femur
♂, La Palma, *type*.......	16.2	2.85	2.68	11
♀, La Palma, *allotype*....	18.6	3.86	3.19	12.2

General color lime green to jade green (Ridgway), in the male becoming yellowish olive to brownish olive on the dark areas of the head and much of the dorsal surface of the abdomen, in the female the entire dorsal surface of the head, thoracic segments and abdomen solidly washed with ochraceous-tawny, the clear greenish of the body in the female being most evident as broad lateral postocular bands extending to and upon the abdomen. Fastigium, much of the face and genae and paired diverging pale bars on occiput, as well as proximal section of the antennae and dashes on the lateral lobes of the pronotum and pleura, wax yellow to chalcedony yellow in the male, the antennae passing to fuscous distad, the tips lacking in the type, the face and genae mottled with brownish olive, which largely colors the occiput; in the female the fastigium, face, occiput and genae are nearly solid ochraceous-tawny, the fastigium washed with dragon's-blood red, which also clearly colors the proximal half of antennae, gradually passing distad to fuscous with the extreme tips narrowly pale ochraceous. Eyes orange-citrine (male) to amber brown (female). Pronotum of male with much streaking of yellowish about the position of the lateral shoulders on the prozona. Apex of abdomen in male with a marked preapical collar of wax yellow on several tergites followed by pale fuscous on the supra-anal plate and adjacent portion of the two preceding tergites, the cerci and lateral sections of same tergites and penultimate sternite fuscous black, subgenital plate pale chalcedony yellow, very narrowly edged at the free margin with blackish fuscous. Green of caudal femora clear and translucent as in the other species of the genus, genicular arches pale buckthorn brown; caudal tibiae in male of the color of the femora, of female ventrad greenish, dorsad dull vinaceous, spines black tipped; caudal tarsi light ochraceous-salmon in male, coral red in female.

In addition to the type and allotype I have before me four immature specimens having the same data as the type. These individuals are three males in the two instars preceding maturity and one female in the last instar preceding maturity. The immature male individuals show the beginnings of the distinctive structure of the male cerci.

The habitat in which this species occurs is one constantly saturated much of the year by fog and rain driven in by the trade winds from the Caribbean. It is in the saddle between the Volcano of Irazú and the group of volcanic peaks centering about the Volcano of Barba.

The species is clearly one of the more generalized members of the genus, showing numerous features which indicate its primitive character. The species with obsolete tegmina and more highly specialized genitalia (male and female), as *miniatulus, viceitas* and *daedalus,* are clearly of more recent development than *L. nebulicola,* which with in some ways the equally generalized *L. ovatipennis* would seem to represent more ancient stocks of the genus. The structure of the dorsal ovipositor valves of *nebulicola* clearly shows the connection of *Lithoscirtus* with those related genera which have these parts of the type more usual in the subfamily.

Lithoscirtus ovatipennis (Rehn)

1905. *Dellia ovatipennis* Rehn, Proc. Acad. Nat. Sci. Phila., 1905, p. 428, figs. 24 and 27. [♀; Carrillo, Costa Rica.]

In addition to the type I have before me a single female of this apparently rare and local species. I have looked for it assiduously on two visits to Costa Rica and have spent three weeks at a similar locality but relatively a few miles from the site of the now abandoned settlement of Carrillo. This lone specimen was taken by me September 12, 1927, on the foliage of a tangle of guayabo and melastomaceous trees between the railroad right-of-way and adjacent potreros near Guápiles. I noted that its coloration in life was very brilliant and gem-like.

In size the Guápiles female is a shade smaller than the type, while the tegmina are proportionately more elongate, reaching nearly to the caudal margin of the median segment.

The base pale green color is clear lumiere green, becoming chalcedony yellow on the lateral surfaces, the darker pattern and most of the femoral tone being bice green to elm green. The genicular regions of the caudal femora are largely blackish fuscous, the pregenicular annulus light chalcedony yellow. The tegmina are shining fuscous black except for the sutural and disto-discoidal dashes of clear green.

The species is clearly a primitive one and with *nebulicola* represents the antithesis of the highly specialized *miniatulus* and its close relatives. The corneous character of the abbreviate tegmina is very different from that found in *nebulicola,* which represents another generalized stock of the genus. Of these two lines of development *ovatipennis* in its proportions, corneous tegmina and type of caudal femora differs more from the other Lithoscirti than does *nebulicola,* but the ovipositor structure of the latter species would also indicate a step in the evolution of the simple rod-like type found in the other species of the genus. In *ovatipennis* the dorsal ovipositor valves are more deplanate and transverse than in *nebulicola,* while in the latter they are appreciably compressed and in consequence deeper than wide dorsad. The ventral surface of the same valves is concavo-deplanate proximad in *nebulicola* and rounded, in no way deplanate, in *ovatipennis.*

GUETARESIA[22] new genus

A very remarkable new genus apparently sharing characters of the groups Stenopolae and Nicarchi, yet suggesting ***Machaeropoles*** and *Homalosaparus* Rehn and *Amblyxypha* Uvarov, which are Vilernoid in affinity. It has much the general build of the genus *Oxyblepta,* agreeing quite well in the pronotal and tegminal form, as well as the basic features of the head, but with the nodulose antennae and general structure of the caudal femora of *Hypsipages* and *Nicarchus* of the Nicarchi, with both of which genera it has been compared. There is also a suggestion of the Copiocerae in the general form, while the head outline brings to mind *Machaeropoles.* In that direction, however, real relationship does not appear to exist, Taken as a whole in its annectant features this genus is one of the most peculiar of my acquaintance. It is probably a very aberrant Stenopoloid type, but until our knowledge is more extensive I would hardly care to say definitely it is not equally near the Nicarchi. Possibly a new group will be necessary for its reception.

The unique type, unfortunately, has had the fastigium and pronotum injured, but the undamaged features are so remarkably distinctive that I feel no hesitation about emphasizing the unusual characters or combination of characters found in this insect.

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[22] From the Guetares, the aboriginal people of the Santa Clara Plains and northeastern Costa Rica.

Generic Characters.—Form elongate, subfusiform; surface of body and portions of limbs ruguloso-punctulate, texture of tegmina distinctly coriaceous. Head strongly produced dorsocephalad, face in profile strongly retreating and concave; fastigium produced, form uncertain;[23] frontal costa continuously developed, narrow and subequal in width, sulcate throughout; supplementary facial carinae marked, continuous; surface of face between costa and supplementary carinae markedly carinate. Eyes but moderately prominent as seen from dorsum, in lateral outline elliptical. Antennae deplanate, except at base and apex alternate articles are twice as long as intervening joints and expanded on external border, producing a distinct nodulose condition. Pronotum longitudinal, subsellate; structure of dorso-caudal region not ascertainable; no decided medio-longitudinal carina indicated cephalad, dorsal surface of prozona with four pairs of rounded tubercles; principal transverse sulcus deeply impressed on dorsum; no distinct lateral angles present on prozona. Tegmina slightly surpassing apex of abdomen, reaching apices of caudal femora, lanceolate, slender, principal venation in proximal half woven together by a network of cross and accessory longitudinal nervures. Wings ample, reaching nearly to apices of tegmina. Posternal spine erect, acute, subspiniform. Interspace (♀) between mesosternal lobes transverse, internal margin of lobes obliquely diverging; metasternal lobes (♀) moderately separated. Ovipositor jaws short, robust, external margins of both pairs with short, heavy teeth. Cephalic and median limbs with femora appreciably enlarged distad, cephalic genicular lobes of both pairs more roundly enlarged than caudal lobes. Caudal femora in lateral outline regularly narrowing from proximal third to genicular enlargement, as seen from dorsum relatively thick, dorsal surfaces subdeplanate, heavily impresso-punctate, pattern of pagina regular, impresso-punctate; medio-dorsal and medio-ventral margins sparsely serrulate, particularly the medio-ventral; other carinae of caudal femora with a few scattered point-like serrulations; genicular lobes slightly acute at apex: genicular extremity meso-dorsad with a pronounced tectiform, acute spination projecting distad. Caudal tibiae externally with seven spines, no apical spine on external margin; internal margin with eight spines, those distad hardly longer than the external spines, those proximad (except basal one) distinctly longer than external ones; margins between spines carinulate. Arolia present; tarsal claws equal, their margins simple.

Genotype: *Guetaresia lankesteri* new species.

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[23] Due to injury to the unique type.

Guetaresia lankesteri[24] new species (Plate II, figs. 3-5.)

Type.—♀; Peralta, Costa Rica. Elevation, 1090 feet. May 21, 1925. (C. H. Lankester.) [Academy of Natural Sciences of Philadelphia, Type no. 5443.]

Size medium: surface of face, ventral portion of genae, pronotum and pleura with the ruguloso-punctulations closely placed, heavy, subcribrose, particularly on the dorsum of the pronotum; on the dorsal section of the genae and on the occiput they are less evenly indicated, and on the occiput are grouped chiefly in two longitudinal, caudad diverging areas; punctulations of sterna less deeply indicated.

Head relatively long, narrow, in cephalic aspect with the outlines of the genae nearly subparallel, in profile the long occiput is probably regularly ascending[25] to very near the narrow interocular space, which does not exceed half the width of the proximal antennal joint: fastigial form and details not ascertainable,[25] but it is clearly in general trigonal, perhaps acute and projecting cephalad of the cephalic border of the eyes a distance subequal to the width of the eye in dorsal view: face in profile very strongly retreating, evenly concave, inter-antennal production of fastigium narrow, and the undamaged portion is regularly arcuate: frontal costa evenly marked from clypeal suture dorsad; supplementary facial carinae slightly expanding ventrad in dorsal two-thirds, thence ventrad subparallel; area between frontal costa and supplementary facial carinae on each side with one nearly complete and indications of another accessory carinae parallel to the costa and the supplementary carinae; a distinct dorso-ventral depression separates the accessory carinae from the genae. External face of mandibles deeply sulcate. Eyes with greatest width (in lateral view) contained one and two-thirds times in greatest length of same, but very slightly longer than the infra-ocular portion of the genae. Antennae equal to three-fifths of the tegminal length, the nodulose condition caused by the arcuate expansion on the external face of at least six of the joints very pronounced, the narrower intervening joints being submoniliform, the expansion of the fourth joint also involving the third, while from the fourth joint from the apex the width regularly narrows to the blunt acute apex; internal margin from the third joint regular and continuously straight; antepenultimate joint with its distal margin appreciably oblique, the disto-internal angle with a distinct but small projecting point.

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[24] Dedicated to the collector of the type, my good friend Mr. C. H. Lankester, of "Las Concavas," near Cartago, Costa Rica, as a token of sincere appreciation of his kindness and cordial help, and an expression of my deep personal regard.

[25] Injury to the type makes accurate description of this area impractical.

Pronotum with cephalic margin of disk gently arcuate produced, form of caudal margin not ascertainable; median paired tubercles small, shining blackish fuscous, distributed as follows; one pair very closely placed immediately on cephalic margin; second pair, faintly more distant, removed from the first pair by the first transverse sulcus; third pair placed slightly caudad of the middle of prozona, three times as widely separated as second pair; fourth pair situated between the principal transverse sulcus and the preceding one, and separated from one another no more widely than second pair; lateral shoulders of prozona well rounded but marked by an appreciably callosed area: lateral lobes longitudinal; cephalic margin arcuate oblique, caudal margin nearly straight; ventro-cephalic angle very broad obtuse, ventro-caudal angle rounded obtuse.

Tegmina very narrow lanceolate, greatest width, which is at proximal fifth, contained five and two-fifths times in the tegminal length; lateral margins in proximal half of tegmen subparallel, faintly curving suturad, near the apex the costal is strongly arcuate to the immediate acute apex, which is suturad; sutural margin in proximal half faintly arcuate by the development of the anal field; costal margin in proximal half rather sharply angulato-arcuate by the lobate expansion of the marginal field at the proximal fifth: principal longitudinal venation well indicated, except for the strongly developed humeral trunk heavily involved in a network of anastomosing cross veins and accessory longitudinal nervures in the proximal half, in the distal half the accessory cross-veins being greatly reduced but the intercalated accessory longitudinal ones are as evident as the principal nervures, the resulting areolets being largely elongate rectangles. Wings with shape of apex of anterior field corresponding with shape of apex of tegmina.[26]

Meso- and metasterna in profile seen to be markedly deplanate. Supra-anal plate elongate acute, very finely sulcate medio-longitudinally in proximal two-fifths. Dorsal ovipositor jaws strongly narrowing distad in profile and regularly narrowing in the same direction as seen from dorsum; dorsal surface faintly excavate; dorso-external margin with four or five well spaced blunt teeth, one of which is the apical hook and appreciably larger than the others; dorso-internal margin with a much more numerous and closely-placed series of fine teeth, which extends a distinctly greater distance proximad than the external series. Ventral ovipositor jaws slightly shorter than the dorsal valves, bluntly oblique subtruncate in shape at apex; ventro-external margin with three spaced teeth similar to those of dorso-external margin of dorsal valves, one being apical; ventro-internal margin with a series of fine teeth; ventral surface of ventral valves transversely grooved, these approximately in line with the teeth of the ventro-external margin.

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[26] On account of the condition of the unique adult it is inadvisable to attempt to spread the wings for the description of their venation.

Cephalic and median limbs with tibiae subequal to the femora in length, the former relatively robust, faintly bent in proximal fourth. Caudal femora reaching to apex of abdomen, in lateral aspect the greatest depth, which is at proximal fourth, contained four and three-fourths times in greatest length, measuring to apex of genicular production; as seen from dorsum the greatest thickness of the femur is five-eighths of greatest dorso-ventral depth (as 20 to 32); dorsal surfaces, except of genicular region, with the impresso-punctations thickly and uniformly placed; external face distinctly deplanate, the pattern evident but not deeply impressed; ventro-external surface impresso-punctate as on the dorsal surfaces: dorsal production of the genicular region pronounced, half as long as the extreme length of the genicular arches, its dorsal surface distinctly tectate and subcarinate medio-longitudinally, the lateral margins in the same view regularly straight convergent to the very acute apex. Caudal tibiae weakly arcuate in proximal half; dorso-lateral margins between the spines serrulato-carinulate. Caudal tarsi with proximal (metatarsal) joint slightly shorter than third joint (in ratio of 20 to 22).

Basic pale color tawny-olive with an overlaid pattern of clouding and stippling, in large part indefinite in type, of raw umber to brussels brown, on the tegmina the base color being auburn with a bay tinge, the principal venation largely buff, sparsely checked and ticked with dashes of nearly pure chestnut. The head is of the general mixture, the dark mainly fine stippling, the eyes tawny olive with a brassy tinge; antennae nearly clay color, finely sprinkled with the darker tone. The pronotum has the dorsal tubercles and a longitudinal undulate cloud crossing the lateral lobes blackish fuscous, the vicinity of the prozonal lateral shoulders and a subcallose subtrigonal area ventro-cephalad on the lateral lobes clay color. Wings tinged with sanford's brown, hyaline. Ovipositor valves with the vicinity of the toothed margins washed with chestnut, the teeth themselves blackish fuscous. Caudal femora with a distinct citrine-drab tendency; tibiae similar but distal section of flexor surface heavily clouded with blackish fuscous, spines ochraceous-buff tipped with blackish fuscous.

Length of body, 23[27] mm.; length of pronotum (estimated), 4.5; length of tegmen, 15.8; length of caudal femur (to apex of genicular process), 13.

In addition to the type I have before me a single immature male of this species, taken by me at La Emilia, near Guápiles, Costa Rica, August 16, 1923. It was secured in heavy forest, presumably from low foliage, although my notes are not definite on this point. It represents at least the second instar preceding maturity and would indicate that the adult condition possesses a marked acute trigonal development of the fastigium. The form of the face, antennae, and caudal limbs are what, judging from the type, would be expected in the younger stages of the species, the antennae showing but three groups of expansion, the distal being equal to a third the entire antennal length, the obliquity of the distal margin of the antepenultimate joint and the minute tooth on the same article being appreciably marked.

Nicarchus enyalius[28] new species (Plate I, figs. 7-8.)

Closely related to the genotypic species *N. erinaceus* Stål,[29] from Panama, known only from the type male, which lacks antennae and caudal tarsi. The features of difference here given are those in which the present material differs from Stål's detailed description of *erinaceus*. The apex of the fastigium is not emarginate in the male of the present species, as it is definitely stated to be in the older form; the proportions of the four prominent lateral spiniform lobes of the pronotal disk are different, the first and fourth being the smaller and the second and third very much the larger, the second largest, instead of the first and second small and third and fourth large, as in *erinaceus;* the caudal femora have the dentations of the dorsal carina second in size only to those of the dorso-external carina. Other differences will probably be found to exist on actual comparison of material.

The descriptions of the antennae and the caudal tarsi here given are the first presented of these parts as developed in *Nicarchus.*

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[27] Approximate, on account of fastigial damage.

[28] From **'Ενυάλιος** *the warlike*, an epithet used for Mars. Given in allusion to the armor-like structure of this insect.

[29] Bihang till K. Svenska Vet.-Akad. Handl., v, no. 4, pp. 34, 78, (1878).

Type.— ♂ ; La Emilia, near Guápiles, Costa Rica. Elevation, 1000 feet. August 22, 1923. (Rehn; in opening in heavy forest.) [Academy of Natural Sciences of Philadelphia, Type no. 5442.]

Size medium; form subcompressed; surface of pronotum and caudal femora spinose, most of dorsum of pronotum, portion of lateral lobes of same, face, genae, pleura and cephalic and median femora rugulose.

Head relatively short, the occiput in profile distinctly but not strongly vaulted, its surface as seen from the dorsum with two pairs of raised callose lines diverging toward the eyes, the ventral, in the usual position of postocular bars, being the more pronounced, the second pair more dorso-cephalic in position and much less evident, an appreciable raised tooth-like tubercle placed mesad at the caudal portion of the interocular space, which is hardly wider than two-thirds of the greatest distal width of the fastigium (as 6 to 8.5): in dorsal aspect the fastigium is produced trigonal, its length cephalad of least width of interocular space being nearly one and one-third times the latter (as 17 to 13), proximal two-fifths of lateral margins obliquely straight convergent, this followed by a short section in which the margins are subparallel, this section terminating on each margin in an elevated production, distad of these the margins sigmoidly converge to the narrowly truncate apex; dorsal surface of fastigium medio-longitudinally sulcato-excavate, narrowing proximad, proximo-laterad those portions of fastigium with oblique lateral margins have their surface obliquely declivent ventro-laterad; in profile the fastigium is seen to be markedly produced, its length but little less than width of eye, dorsal line of fastigium horizontal except for the rounded elevation above mentioned, distad the fastigial outline narrowly passes from the dorsal level over rounded distal section to moderately retreating face; in cephalic aspect the fastigial production is seen to be compressed and very narrow where it joins the dorsal surface of the fastigium, ventrad of same roundly though shallowly sulcate, the same obsoletely indicated ventrad across the face to the clypeal suture, the lateral margins of the costa there indicated mainly by several pairs of knobs, the more evident at the clypeal margin, the costal grooving appreciably inflated half-way between the median ocellus and the clypeal suture; supplementary facial carinae subparallel in dorsal three-fourths, briefly but appreciably diverging in ventral fourth, in elevation serrato-dentate in three or more projections, of which the ventral is the most decided: surface of genae with an appreciable but irregularly delimited and shallow oblique ventro-cephalad directed sulcation, accompanied by irregular series of rugulose low blunt tubercles. Eyes from dorsum very prominent, subexserted, in cephalic aspect distinctly elevated dorsad of interocular space, in lateral view elliptical in outline, greatest width contained one and four-tenths times in greatest depth (ratio as 17 to 24), the latter being one and two-thirds times as deep as the infra-ocular portion of the genae, the axis of the eye also being slightly oblique. Antennae nearly twice as long as the pronotum, composed of sixteen articles, distinctly nodulose by the inflation of alternate articles, except in the case of the three abbreviate distal articles, antepenultimate article with a small acute dentate projection mesad on dorsal surface;[30] enlarged segments generally twice as long as the narrower, simpler intervening articles, and in outline all of them except the fifth article are reversed tear-shaped, the expansion of the segment being dorso-external in position, the internal and ventral faces showing only the general moniliform differentiation of the articles, the fifth with the expanded surface more extensive proximad and the article less tear-shaped; apex of antennae bluntly rounded; segments three to nine more triquetrous in section than those distad.

Pronotum with lateral surfaces subparallel, dorsum, particularly of metazona, subdeplanate, greatest width across spinose processes of caudal section of prozona contained nearly one and one-third times in greatest pronotal length: in profile the median carina of the pronotum is seen to be developed into four erect, narrow, compressed, dentate lobations, three of which are very prominent; the first between the cephalic margin and the first transverse sulcus high, subequal to two-thirds the greatest dimension of the eye, its apex very acute, its cephalic margin with a proximal and a preapical obtuse angulation; the second quite short, acute, not more than a third as high as the first, situated between the first and second transverse sulcus; third, situated between the second and third transverse sulci, subequal to the first in height, slightly sloping dorso-caudad, narrowing distad, the apex narrowly rounded; fourth placed at the apex of the rectangulate caudal margin of the disk, appreciably lower than the third, its apex somewhat recurved and narrowly rounded in profile, the lateral sections of the caudal margin convergingly elevated along the ventro-caudal surface of the process; median carina on metazona cephalad of fourth median process roundly and broadly carinate, little elevated: cephalic margin of pronotal disk very obtusely angulate, mesad subemarginate: metazona of disk nearly five-eighths the prozonal length (ration 21 to 35);

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[30] This is the type of development found in *Guetarcsia* described above.

surface of prozona coarsely yet not at all sharply cribroso-rugulose, surface of metazonal disk much more distinctly and thickly cribroso-punctate: general position of lateral carinae of disk indicated by spinose processes directed laterad and slightly dorsad, and by color pattern and surface texture as follows: cephalad, intermarginally, is a low blunt spinose tubercle, caudad of which by color and texture indications the carinae are concave, distinctly diverging caudad, and immediately cephalad of second transverse sulcus with a distinct, relatively low, boss-like tubercle, which is narrowly divided at apex; between second and third transverse sulci is placed a very large acute conical and spinose process, strongly diverging laterad and subdeplanate dorsad, in length but little shorter than the major median processes; at caudal margin is another process similar in shape, character and divergence to the preceding one, but distinctly smaller; lastly the caudal margin half way to the median production bears on each side a similar but smaller production, not more than half the size of the one preceding it and directed caudo-laterad with a distinct dorsad trend. Lateral lobes of pronotum longer than deep, greatest depth equal to three-fourths dorsal length of lobe; cephalic margin slightly oblique arcuate, caudal margin much more strongly straight oblique, caudal half of ventral margin straight, slightly oblique ventro-cephalad in trend, cephalic half of same margin distinctly subarcuate concave; ventral and cephalic margin distinctly cingulate, the cephalic and caudal each with three or four distinct but low, spaced tubercles: approximately the ventral half of the lobes distinctly and closely rugulose, this also evident on dorsal half of the metazona of the lobes, dorsal half of the lobes with the surface velutinous, even over the rugulosity of the metazona; the intermarginal, second and third transverse sulci clearly incised on the lateral lobes.

Tegmina subcoriaceous, very slightly longer than greatest dorsal length of pronotum, reaching caudad only to middle of third abdominal tergite, broadly lobate distad, in general form reversed cuneate, the greatest width at five-eighths of length, contained slightly more than two and one-third times in greatest length of same: costal margin to point of greatest width subconcavely oblique expanding, broadly arcuate over point of greatest width and then straight oblique convergent to the rather narrowly rounded apex; sutural margin straight in distal two-thirds, thence regularly arcuate to the apex: marginal field narrow proximad, quite broad at point of greatest width, there constituting nearly half of the tegminal width, course of humeral trunk nearly straight, ulnar vein evident, accessory venation made up of adventitious intercalated longitudinal nervures with anastomosing short cross-veins producing a longitudinal, subrectangulate type of areolation. Wings shorter than tegmina.

Prosternal spine erect, slender, acute. Interspace between mesosternal lobes transverse, internal margins of the lobes obliquely arcuate divergent. Metasternal lobes separated by a broad cuneate interspace, which caudad is but half as wide as its cephalic width.

Pleura with a distinct but low ridge-like tubercle situated immediately cephalad of the cingulation of the median limb socket; ridge dorso-cephalad of insertion of caudal limb decided but broken by rugulosities. Abdomen with medio-dorsal line of tergites tectato-carinate, the caudal point of the same on each segment progressively distad developed into a spiniform process, on the ninth tergite this being an erect spinule. Distal margin of tergite preceding supra-anal plate with five spaced tubercles directed caudad in the usual position of the furcula. Supra-anal plate scutellate, its lateral margins subparallel in proximal two-fifths, thence obliquely subacute convergent, the immediate apex faintly upturned and slightly bulbous; surface of supra-anal plate deplanate, weakly impressed within the lateral margins, in proximal half weakly medio-longitudinally sulcate, four pairs of spaced tubercles are placed regularly medio-longitudinally along the plate, decreasing in size and in intervals distad. Cerci short, thick, crassly conical, hardly surpassing apex of supra-anal plate, hardly at all compressed; apex nodulose, blunt acute. Subgenital plate relatively elongate, produced conical at apex in an acute tubercle, which is narrowly post-marginal in position; dorsal margins of plate as seen from dorsum acute convergent.

Cephalic and median limbs relatively heavy, the femora robust, subinflated and rugulose, in profile appreciably bowed; cephalic and median tibiae stocky, distinctly bowed in profile. Caudal femora robust, thickened, yet in profile regularly attenuate to pregenicular region, the greatest depth, which is at proximal fourth, contained four and one-third times in greatest femoral length; dorsal surfaces appreciably deplanate, with scattered low tubercles, the median carina indicated solely by a series of six to seven prominent serrate dentations, with intercalated similar structures of a minor category, distad the series terminates in a prominent, distad produced, acute spinose process over the genicular extremity; dorso-external carina with a similar series but distinctly larger, projecting laterad, the larger ones, which are mesad in the series, being distinctly recurved caudad and also in general form deplanate, so that when viewed in distal aspect they are seen to have their dorsal surfaces horizontal and very decidedly overhanging the external face of the femora; dorso-internal margin with a series of serrato-dentations similar to those of the dorso-external margin but very distinctly smaller and less specialized; external face with the paginal pattern distinctly impressed, its margins weakly and irregularly tuberculate; ventro-external margin with six low but very marked and widely spaced serrato-dentations; ventral margin with eight to ten small spaced serrulations; genicular lobes moderately acute, not produced. Caudal tibiae with seven external and nine to ten internal spines, mesad the internal being slightly longer than the external; internal genicular spurs nearly equal, that extensor in position faintly the longer. Caudal tarsi with first (metatarsal) article three fourths as long as third article (as 15 to 20).

Allotype.— ♀ ; same locality as type. September 14, 1927. (Rehn; in opening in heavy forest.) [Academy of Natural Sciences of Philadelphia.]

The following features are those of differences from the above description of the male sex.

Size larger; surface of body as a whole more distinctly rugulose.

Width of interocular space equal to greatest width of fastigium at distal third; in dorsal aspect the fastigium is as in male except length cephalad of least interocular width is subequal to greatest (proximal) width of fastigium; apex of fastigium as seen in dorsal view shallowly obtuse-angulate emarginate; sulcation of dorsal surface of fastigium proportionately shallower and broader than in male; in cephalic aspect the fastigial production is not as distinctly compressed where it joins the dorsal surface of the fastigium, its sulcation regularly passing to the dorsal surface; frontal costa much more distinctly defined ventrad across the face to the clypeal suture, margins of costa undulate but decided, the shape and general emphasis as in male. Eyes in cephalic aspect less elevated dorsad of interocular space, in lateral view more elongate elliptical, greatest width contained one and one-half times in greatest depth (as 18 to 27). Antennae but slightly longer than greatest dorsal length of pronotum, composed of fourteen to fifteen segments, certain distal articles showing plasticity in their progressive segmentation; in the arrangement of enlarged articles the third and fourth are both inflated, the former distinctly reversed conical, the latter faintly shorter but of subequal width, both with their dorsal faces subconcave, in the expansion of the ventral surface these segments are noteworthy, the third having its elongate trigonal and sectionally triquetrous form there terminating in an acute lobe, while the fourth has a lower lamellate longitudinal border on same surface.

Pronotum proportionately shorter and broader than in male sex, greatest width across spinose processes of caudal section of prozona contained one and one-third times in greatest pronotal length (as 63 to 85): in profile the dentate lobations on the median carina are as in the male except that the second (the low one) is more acute and somewhat higher, the third is slightly more dorso-caudal in direction and is sharper at the apex, while the fourth is less elevated and recurved; median carina on most of metazona more elevated and compressed than in male: processes of lateral carinae as in the male with the following differences, the first is more elongate and subspinose, less tuberculate; the third is proportionately broader, more truly trigonal as seen from dorsum and the lateral apices are more caudal in position; the fourth process more closely approaches the third in position, is more dorsal in trend and proportionately larger in size, while the pair of processes along the caudal margin are placed much nearer the fourth, are larger, more spinose and much more distinctly dorsal in trend, being more slender but no shorter than the fourth. Lateral lobes of pronotum slightly shorter and deeper proportionately, the greatest depth approximately four-fifths the dorsal length of lobe: margins as in male except that caudal section of ventral margin is slightly more ascending caudad; tubercles along cephalic and caudal margins larger, much more prominent and elevated than in male.

Tegmina no longer than greatest dorsal length of pronotum, greatest width contained two and one half times in greatest length (as 32 to 80); sutural margin more regularly and broadly arcuate as a whole than in male.

Abdomen with caudal production of medio-dorsal carina of tergites more strongly produced caudad and more unguiculate than in male, not being more erect on the ninth than on the other tergites. Supra-anal plate slightly elongate trigonal, apex acute, proximal two-fifths sharply marked off from distal section by a deeply-cut transverse shoulder; medio-longitudinal sulcation of proximal section shallow. Ovipositor valves relatively narrow; dorsal valves with dorsal surface appreciably deplanate, external margin sharp, finely crenulate, in profile the apex briefly hooked; ventral valves in ventral view with external margin sharp and finely crenulate with a distinct but not pronounced proximal shoulder, ventral surface weakly concave. Subgenital plate scoop-shaped, in ventral view regularly narrowing distad, in profile with distal section curving dorsad; distal margin narrowly rectangulate produced mesad.

Cephalic and median femora more decidedly longitudinally rugoso-carinate than in male, the carinae sometimes serrulate. Caudal femora with dorsal surfaces much more thickly and strongly spinuloso-tuberculate; spinoso-lobation of the caudal femora throughout stronger, heavier and somewhat more lamellate, the supra-genicular spine longer and stouter; genicular lobes decidedly more acute. Caudal tarsi with first (metatarsal) article thirteen-twentieths as long as third article (as 19 to 29).

Pale base color of head, dorsum of pronotum, ventral portion of lateral lobes of pronotum, much of all femora and cephalic and median tibiae apple green (♂) to biscay green (♀). Postocular bar on dorsal section of lateral lobes of pronotum, marginal field of tegmina, pleura and ventral surface bay to pale auburn, dilute on venter, most decided on pronotum. Head with tubercles of frontal costa and facial carinae more amber yellow, flecked with fuscous black on the more elevated points, the margins of the costa inter-antennally regularly ticked with the same; dorsal infra-antennal part of face washed with pale ferruginous. Antennae greenish, proximad becoming washed more distinctly with ferruginous to hazel. Eyes buckthorn brown, mottled to a variable degree with prout's brown. Pronotum with the first and third medio-dorsal processes clouded with fuscous-black distad, scattered tubercles on the dorsal pronotal surface similarly colored, also the ventral surfaces of the lateral processes; brownish postocular bar sharply delimited dorsad on the pronotum by the lateral processes and cephalad by an obtusely arcuate line of fuscous-black, ventrad the bar is concavely bordered by a line of blackish fuscous, marginal tubercles of lateral lobes nearly all fuscous-black. Tegmina with the contrast between the brownish of the marginal field and the very dull greenish of the remainder of the tegmina but moderate, a few obscure fuscous dots indicated to a variable degree in the greenish area. Dorsal surface of abdomen mottled green and yellowish green with obscure stipplings and cloudings of fuscous-black; apex of abdomen greenish with tubercles of supra-anal plate and preceding tergites pointed with fuscous-black. Cephalic and median limbs with green color varying in tone and the whole irregularly and obscurely subannulate, or at least ticked, with fuscous-black on the carinae. Caudal femora with the dorsal surface bearing three poorly defined creamy patches, one proximad, one premedian, the third median, all washed with pinkish, irregularly shaped and separated by areas of jade green to yew green, the whole pattern of this surface more marked and evident in the female than in the male; vicinity of ventro-external carina of femora weakly washed with dull pinkish, the serrations of the same carina proximad touched with fuscous-black, while the very conspicuous dorsal and dorso-lateral processes are of the general green, the darker green or the pinkish cream of the adjacent surfaces; ventral sulcus of caudal femora strongly washed with scarlet-red proximad. Caudal tibiae scarlet-red distad, of the general green proximad, all spines narrowly tipped with fuscous-black; caudal tarsi washed proximad with scarlet-red on a green ground.

Measurements (in millimeters)

	Length of body	Dorsal length of pronotum	Length of tegmen	Length of caudal femur
♂, *type*	16.6	4.62	4.78	10.9
♂, *paratype*	15.9	4.78	4.7	10.5
♀, *allotype*	21.9	6.88	6.97	13.4

In addition to the type and allotype I have before me an allotypic male bearing the same data as the type, and from the collection of the Academy.

The captures of the known specimens of this species were attended by more than usual interest to me. All were secured in a small felling of possibly an acre in extent in heavy forest, about five miles south of the cattle farm of La Emilia. Nearly all the larger trees in this area had been cut quite a few years before, several large logs remaining, these almost buried under mosses and the other plant life, which, under some conditions, soon completely clothe fallen forest monarchs in the tropics. The low undergrowth had choked much of the clearing and great mats of vines and lianes hung like vast nets of war-time camouflage, blocking the view and also passage into the deep shadows of the still undispoiled "montaña." On August 23, 1923, while examining one of the great felled giants, shrouded in a living winding-sheet of green,[31] a single male of this species, most perfectly protected in its form and color in such a situation, jumped but a few inches from my face. A brief pursuit was soon rewarded by its capture. Knowing at once the great rarity of the insect, I immediately applied all my efforts to securing more of it, and in less than an hour another male was swept from heavy undergrowth, about thirty feet from the spot where the first male was taken. Search was unsuccessfully continued for the species on parts of several other days that season. In 1927 I spent five days in the same piece of forest, as far as possible examining many spots visited in 1923, as well as territory not carefully studied during the two weeks spent about Guápiles the latter year. The clearing where the type of this species was taken had been extended somewhat in area, and more sunlight reached the forest floor, while the ground tangle was much heavier and the thicket growth harder to penetrate. Reviving old memories I was walking along either the same or a similar old mouldering trunk as that from which I had taken the first specimen of *Nicarchus*, when something stocky and green jumped in heavy foliage alongside of me, and the first female of the species was soon in my hands.

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[31] This prostrate tree-trunk is the one shown in the second plate, lower figure, accompanying my account of the 1927 Costa Rica field work in the Year Book of the Academy of Natural Sciences for 1927. The photograph was taken in 1923. In 1927 the area photographed was more overgrown.

In life the vividness of the green of this insect is most unusual, and its contrast with the red of the caudal tibiae is very decided. All in all *Nicarchus cnyalius* is probably the most striking and bizarre acridid which I have ever handled alive.

MICROTYLOPTERYX Rehn

1905. *Microtylopteryx* Rehn, Proc. Acad. Nat. Sci. Phila., 1905, p. 448

This genus was originally referred to in the vicinity of *Rhachicreagra* Rehn, described at the same time, and by inference to the neighborhood of *Polysarcus* Saussure (=*Pycnosarcus* Bolivar). Both of these assignments are erroneous, as it is not at all related to either of these genera and in addition they have no affinity with one another. The genus *Rhachicreagra* is of uncertain position, but is clearly as near the Mexican genus *Teinophaus* Bruner[32] as anything known. The determination of the group relationship of these two genera will require careful analytical study, not possible at this writing. On the other hand

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[32] Biol. Cent.-Amer., Orth., II, pp. 222, 332, (1908). *Genotype.—T. saussurei* Bruner.

Pycnosarcus is very near the Group Nicarchi, sharing many features in common with *Nicarchus* and *Hypsipages*.

The genus *Microtylopteryx* in its entire make-up has a most distinct individuality, which seems more nearly to be approached, and then but distantly and probably superficially, by the genus *Aspidophyma* Bolivar,[33] described from two species, one recently separated generically.[34] *Aspidophyma* was originally placed in the Pyrgomorphinae. Kirby[35] indicated as the genotype *A. americana*,[36] and also placed the genus in the Pamphaginae. Uvarov, in comments made when generically separating *indica* from *americana*, considered *Aspidophyma* to belong to the Catantopinae (=Cyrtacanthacrinae), with which I agree, although I have no material of true *Aspidophyma*. A pair of *Acaeropa indica*, from Nura Eliya, Ceylon, is before me and I can definitely say that genus is in no way related to *Microtylopteryx*. As far as can be judged from the generic description of *Aspidophyma*, and that of the genotype *A. americana*, *Microtylopteryx* is equally distinct from that genus. Tentatively at least I propose to place the present genus in a Group Microtylopteryges, allotted for the present near the Rhytidochrotae at the end of the subfamily.

As I have before me an extensive series of the genus and two new species requiring description, it seems most advisable to review the genus, as has here been done in the case of *Lithoscirtus*.

For some unknown reason Bruner ignored my very definite original indication of *M. hebardi*[37] as the genotype, and proposed to use instead *M. fusiformis*,[38] which action of course has no validity.

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[33] Anal. Soc. Españ. Hist. Nat., XIII, pp. 26, 491, (1884).

[34] By Uvarov (Spolia Zeylanica, XIV, p. 107, (1927)), the genus *Acaeropa* being erected for *Aspidophyma indica* Bolivar.

[35] Synon. Catal. Orth., III, p. 342, (1910).

[36] Bolivar, Anal. Soc. Españ. Hist. Nat., XIII, p. 492, pl. 4, figs. 32, 32a.

[37] Proc. Acad. Nat. Sci. Phila., 1905, p. 448, (1905).

[38] Biol. Cent.-Amer., Orth., II, p. 341, (1908).

Key to the Forms of the Genus

A. General build distinctly fusiform; body strongly widened at insertion of caudal femora as seen from dorsum. Fastigium with general outline as seen from dorsum sharply trigonal; dorsal surface of fastigium convex in transverse section; dorsal extension of sulcation of frontal costa narrow, subfissate. Fastigio-facial angle in profile rounded acute. Pronotum strongly tectate dorsad; median section as a whole more regularly elevated caudad; disk strongly broadening caudad; cephalic margin of disk narrowly emarginate mesad. Tegmina spatulate. Limbs short, robust; caudal femora appreciably inflated as seen from dorsum and in lateral aspect. (Fusiformis Group.)

B. Form less compressed across the head and cephalic portion of pronotum. Fastigium in dorsal aspect moderately acute in the female sex, less produced in both sexes than in alternate category. Caudal femora with their inflation very pronounced, greater in depth and more bullate laterad.

C. Fastigium as seen from dorsum with proximal width greater in proportion to fastigial length in both sexes. Head, in cephalic aspect, proportionately broader in both sexes. Median carina of pronotum in profile more arcuate.

D. Eyes in both sexes more pronounced, more prominent laterad and more elevated dorsad as seen in cephalic aspect. Ventral section of face more deplanate. Facial line as seen in profile shallowly but appreciably concave briefly ventrad of fastigium. *fusiformis fusiformis* Rehn

DD. Eyes in both sexes less pronounced, less prominent laterad and less elevated dorsad as seen in cephalic aspect. Ventral section of face less deplanate. Facial line as seen in profile evenly and unbrokenly straight oblique ventrad of fastigium. *fusiformis lamprus* new subspecies

CC. Fastigium as seen from dorsum with proximal width less in proportion to fastigial length in both sexes, these dimensions more nearly subequal. Head, in cephalic aspect, proportionately narrower in both sexes. Median carina of pronotum in profile straighter, more horizontal. (Facial line in profile virtually straight oblique.) .... *talamancae* new species

BB. Form more compressed across the head and cephalic portion of pronotum. Fastigium in dorsal aspect decidedly acute in female sex, comparatively more produced in both sexes. Caudal femora with their inflation less evident, shallower in depth and less decided laterad. (Coloration duller, more uniform.)...*tristani* new species

AA. General build elongate; body not strongly widened at insertion of caudal femora as seen from dorsum. Fastigium with general outline as seen from dorsum not sharply trigonal; cephalic outline broadly emarginate mesad as seen from dorsum; dorsal surface of fastigium not convex in transverse section; dorsal section of sulcation of frontal costa broad. Fastigio-facial angle in profile narrowly rounded rectangulate. Pronotum hardly at all tectate dorsad; median carina rather sharply arcuate elevated on the abbreviate metazona; disk less strongly broadening caudad; cephalic margin of disk non-emarginate mesad. Tegmina narrow, lanceolate. Limbs elongate, relatively slender; caudal femora hardly inflated as seen in dorsal and lateral aspects. (Hebardi Group.)

B. Head proportionately broader in both sexes. Limbs longer, particularly the caudal pair. Tegmina bicolored. Male with face and genae light yellow.....*hebardi* Rehn

BB. Head proportionately narrower in both sexes. Limbs shorter, particularly the caudal pair. Tegmina unicolorous, pale. Male with face and genae fuscous. *nigrigena* Hebard

Microtylopteryx fusiformis Rehn

This species is divisible into two geographic races, which are differentiated in the above key and here discussed separately.

Microtylopteryx fusiformis fusiformis Rehn (Plate V, figs. 3, 7, 11.)

1905. *Microtylopteryx fusiformis* Rehn, Proc. Acad. Nat. Sci. Phila., LVII, p. 451, figs. 41, 43. [♂, ♀; Carrillo, Costa Rica.]

1908. *Microtylopteryx fusiformis* Bruner, Biol. Cent.-Amer., Orth., II, p. 341, pl. 4, figs. 27, 27a. [Nicaragua; Carrillo and Juan Viñas, Costa Rica.]

The typical subspecies of *fusiformis* occurs in the Santa Clara Plains of northeastern Costa Rica, about the north and east bases of the volcanoes of Turrialba and Irazú and up the valley of the Reventazón River at least to Juan Viñas. Its range extends up the Pejivalle tributary of the Reventazón at least as far as Pejivalle Farm. Apparently the typical subspecies passes into *f. lamprus* somewhere between Juan Viñas and San José, at the latter point, across and on the west side of the Continental Divide, atypical *f. lamprus* being found. The material recorded from Nicaragua by Bruner (vide supra) is credited to the Bruner Collection, which now forms part of the Hebard Collection at the Academy of Natural Sciences of Philadelphia, but no trace of it can there be found. It is very possible that *M. fusiformis fusiformis* is distributed over much of the lower forested portions of eastern Nicaragua.

I here indicate as the single (lectotypic) type of *Microtylopteryx fusiformis* the male of the original type pair from Carrillo, which specimen is now type number 369 of the Hebard Collection.

The following series of *M. f. fusiformis* are before me:

Carrillo, Costa Rica; June, 1903 (on three specimens); five males, ten females, one immature female, *type, allotype* and remainder largely *paratypes;* [Hebard Cln., and A. N. S. P.].

Rio Toro Amarillo, west of Guápiles, Costa Rica, elevation 1000 feet; August 19, 1923; (Rehn); one male; [A. N. S. P.].

Guápiles, Costa Rica; November 26, 1903; one male; [Hebard Cln.]: (Carriker); one female; [Hebard Cln.].

Forest above La Emilia, near Guápiles, Costa Rica, 1000 feet elevation; August 12-24, 1923; (Rehn); fifteen males, sixteen females, three immature males, three immature females; [A. N. S. P.]: September 12-15, 1927; (Rehn); six males, eight females, five immature females, [A. N. S. P.].

Guácimo, Costa Rica, elevation 600 feet; June 7, 1909; (P. P. Calvert); one female; [A. N. S. P.]: August 23, 1923; (Rehn); two females; [A. N. S. P.].

Siquirres, Costa Rica, elevation 190 feet; September 16, 1927; (Rehn); one male; [A. N. S. P.].

Pejivalle, Rio Pejivalle, Costa Rica, elevation 2100 feet; August 12, 1927; (Rehn); one male, one female; [A. N. S. P.].

Juan Viñas, Costa Rica; March, 1902; (L. Bruner); eight males, twelve females, two immature females; [Hebard Cln., and A. N. S. P.]: December 2, 1909; (P. P. Calvert); one female; [A. N. S. P.].

In each of the August and September series from the forest above La Emilia the two instars preceding maturity are represented in the immature females.

Microtylopteryx fusiformis lamprus[39] new subspecies (Plate V, fig. 4.)

This subspecies is separable from the typical form of the species of lower levels (i. e. *M. fusiformis fusiformis,* discussed above) by the more even and unbroken slope of the fastigio-facial line as seen in profile, the less prominent laterad and less dorsad elevated eyes as seen in cephalic aspect, as well as by the head being proportionately wider across the genae and the ventral section of the face less deplanate.

Type. — ♂ ; Monte Redondo, Candelaria Mountains, Costa Rica. March, 1902. (L. Bruner.) [Hebard Collection, Type no. 1148.]

As in its general features and coloration the present subspecies is identical with *M. fusiformis fusiformis,* which was originally described in full detail, the following description is solely of those characters of difference from the typical form of the species.

Head as seen from the dorsum with eyes less prominent laterad and these slightly broader (i. e. cephalo-caudad), the fastigium in dorsal aspect heavier in structure and thicker, although of essentially the same form as in *M. f. fusiformis*: in profile the fastigio-facial line is regularly straight oblique, not appreciably concave ventrad of the fastigium in the vicinity of the median ocellus: in cephalic aspect the dorsal curve of the eyes is not at all elevated dorsad of a fastigio-occipital line, the dorsal section of the eyes is not at all bullate and the latter are much less inflated ventrad; head across genae relatively full, more distinctly so than in *M. f. fusiformis,* the surface of the genae also less deplanate; face as a whole more transversely arcuate and less excavato-deplanate than in the typical form.

Pronotum in profile has the median carina of the disk more deeply and strongly concave in the section between the second and third transverse sulci; lateral lobes of pronotum proportionately slightly shorter and less longitudinal.

Length of body, 13.9 mm.; length of pronotum, 3.61; length of tegmen, 2.52; length of caudal femur, 9.1.

In addition to the type I have before me an atypical male from San José (March 20, 1902; (L. Bruner); [Hebard Cln.]), which is slightly smaller than the type, and also shows the distinctive features of subspecies in a weaker degree, demonstrating the passage of this geographic race into *M. f. fusiformis.*

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[39] From λαμπρος *brilliant,* in allusion to the sheen of the sides.

Microtylopteryx talamancae new species (Plate V, figs. 5, 6, 8, 9, 12 and 13.)

A member of the Fusiformis Group of the genus, differing from that species in the somewhat more compressed form, the acute and more produced fastigium as seen from the dorsum and also in lateral aspect, and in the details of the median carina of the pro-, and metanota, and the proximal tergite. The two species are closely related but a comparison of the fastigial form alone will demonstrate their distinctness. From *M. tristani*, described below, *M. talamancae* differs principally in its general body width, which is virtually intermediate between that of the other species, more compressed than in *fusiformis*, less compressed than in *talamancae*, in the less strongly spatulate tegmina, in the more slender, less bullate caudal femora, and in the numerous punctae being coarser and larger, thus agreeing with *fusiformis*.

Type.— ♂ ; North end of Suretka Trail, along Duroy River, Estrella Valley, Limón Province, Costa Rica. Elevation, 100-150 feet. September 9, 1927. (Rehn; on foliage of forest undergrowth.) [Academy of Natural Sciences of Philadelphia, Type no. 5471.]

General form and character as in *M. fusiformis*, except for the more compressed body, surface texture and color pattern as in same. The following features are in the main those sufficiently different from the type found in *M. fusiformis* to warrant comment.

Head more compressed than in *fusiformis*, when seen in both dorsal and cephalic aspects. Fastigium from dorsum acute-angulate produced, immediate apex narrowly subtruncate, narrowly sulcate dorso-ventrad, lateral margins straight oblique; dorsal surface of fastigium transversely convex: in profile the dorsal surface of the fastigium is horizontal, not at all declivent cephalad, but little ventrad of the general plane of the moderately arcuate occiput; fastigio-facial angle narrowly rounded acute; facial line in profile appreciably oblique, retreating, straight. Frontal costa as seen in cephalic aspect relatively narrower than in *fusiformis*: face appreciably narrower than in *fusiformis*, in proportion to the narrower head. Antennae as in *fusiformis* but slightly more slender in the section between articles two and ten. Eyes in cephalic aspect slightly more inflated dorsad; in profile slightly narrower ventrad than in *fusiformis*.

Pronotum in profile with the median carina as a whole more horizontal, less markedly undulate about the depression caudad of the median low elevation, the caudal elevation also straighter. Metanotum with median carina slightly more acute caudad.

Proximal tergite of abdomen with median carina relatively lower than in *M. fusiformis*, not at all raised caudad as in *fusiformis;* median carina of remaining tergites as in *fusiformis*. Abdominal appendages as in *fusiformis*.

Limbs as in *M. fusiformis*.

Allotype.—♀; same data as type. [Academy of Natural Sciences of Philadelphia.]

The following features are the more evident ones of distinction from the same sex of *M. fusiformis*.

Form slightly more compressed, particularly of the head and pronotum.

Fastigium seen from dorsum appreciably more acute-angulate than in *M. fusiformis*, immediate angle as in the male sex, lateral margins appreciably concave as in the female sex of *fusiformis* but less strongly divergent caudad, transverse curvature of dorsal surface as in male; in profile the fastigium is slightly more deplanate than in male; facial line similar in slope to male but appreciably though weakly concave. Frontal costa as in male sex, proportionately narrower than in the corresponding sex of *fusiformis*.

Proximal tergite of abdomen differing as in male sex.

Abdominal appendages as in female of *M. fusiformis*.

Limbs as in *M. fusiformis*.

Coloration as in *M. fusiformis* but dark lateral areas on the genae, pronotal lobes, pleura, and sides of abdomen more solidly shining fuscous black, the lateral carinae of the pronotal disk much paler and more contrasted than in *M. fusiformis*, the dorsal surface as a whole also more ochraceous. The ventrad converging pale lines of the face are generally pronounced, contrasted and conspicuous, much more evident than in *M. fusiformis*, while the dorsal face of the caudal femora is generally distinctly transverse dark bifasciate.

Measurements (in millimeters)

	Length of body	Length of pronotum	Length of tegmen	Length of caudal femur
♂, Atalanta Farm, *paratype*	14	3.36	2.35	9
♂, North end of Suretka Trail, *type*	15	3.78	2.52	9.6
♂, Suretka Trail, *paratype*	16	3.94	3.19	10.2
♀, Atalanta Farm, *paratype*	18.9	4.2	3.36	10.8
♀, North end of Suretka Trail, *allotype*	21.7	5.12	3.61	11.9
♀, Suretka, *paratype*	21.3	5.04	3.61	13.1

In addition to the type and allotype I have before me the following material referable to this species, all the adults of which I consider paratypes:

North end of Suretka Trail along Duroy River, Estrella Valley, Costa Rica, elevation 100-150 feet; September 8 and 9, 1927; (Rehn; on foliage in heavy forest); six males, two females, one immature male, one immature female; [A. N. S. P.].

Suretka Trail between Estrella and Sixaola Valleys, Costa Rica; May 19, 1924; (J. C. Bradley); one male, two females; [Cornell Univ. and A. N. S. P.].

Suretka, Sixaola Valley, Limón Province, Costa Rica; April 26, and May 31, 1924; (J. C. Bradley); two females; [Cornell Univ. and A. N. S. P.].

Atalanta Farm, Estrella Valley, Costa Rica, elevation 100-150 feet; September 7-10, 1927; (Rehn; not common on foliage of low ground cover under bananas); two males, four females, two immature females; [A. N. S. P.].

Pandora Farm, Estrella Valley, Costa Rica, elevation 100 feet; September 13, 1923; (Rehn; from low growth in dense forest); one female; [A. N. S. P.].

Saturno Farm, Estrella Valley, Costa Rica, elevation 100 feet; September 12, 1923; (Rehn; in tangled vegetation on edge of heavy forest); two males, one female, one immature male; [A. N. S. P.].

Vesta Farm, Estrella Valley, Costa Rica, elevation 200 feet; September 13, 1923; (Rehn; numerous on low undergrowth and rarely on higher vegetation in heavy forest); seven males, five females; [A. S. N. P.].

This series shows an appreciable amount of variation in color tone, in size, as shown in the above comments and measurements, and to a degree in the fastigial angle and pronotal outline as seen in profile. These fluctuations, however, are paralleled in *M. fusiformis* and are no greater than those found in the latter species. The specimens from Atalanta Farm from banana grove conditions show less stability in their accentuation of the structural features of the species than those individuals from forest habitats.

It is possible that the future may show *M. talamancae* to be subspecifically connected with *M. fusiformis*, but without material clearly and unquestionably demonstrating this at the present time, I prefer to consider them specifically distinct. The species *talamancae* is a form of the lower country of the old Talamanca district of Costa Rica, while *fusiformis* inhabits the territory to the northwest, with *f. lamprus* at higher elevations considerably to the west.

Microtylopteryx tristani new species (Plate V, figs. 1, 2, 10, 14 and 15.)

A member of the Fusiformis Group of the genus, related to *M. fusiformis* Rehn and *talamancae,* described above, differing from the former in its more compressed form, more produced and acute fastigium, as seen in both dorsal and lateral aspects, in the lower elevation of the median carina of the pro- and metanota and proximal abdominal tergite, in the more slender and less bullate caudal femora, and in the more uniform distribution and finer character of the numerous punctae, with the consequent reduction of the smoothly polished areas.

From *M. talamancae* the present species differs most strikingly in the features given under that insect.

Type.— ♂ ; La Palma, between the volcanoes of Irazú and Barba, Costa Rica. Elevation, 5000 feet. July 29, 1927. (J. Fidel Tristán and J. A. G. Rehn; on foliage along edge of cloud forest.) [Academy of Natural Sciences of Philadelphia, Type no. 5472.]

The following description is an elaboration of the above cited differential characters as compared with *M. fusiformis* and *talamancae,* with such other features as seem noteworthy.

Body fusiform, distinctly compressed, the caudal femora very markedly so when seen from dorsum and compared with related species. Surface more uniformly impresso-punctate, these punctae finer in character, smoothly glabrous areas reduced, the only considerable ones being laterad on the abdomen and on the external face of the caudal femora.

Fastigium as seen from dorsum acute-produced, its apex relatively broad and appreciably but very briefly sulcate, the lateral margins of the fastigium shallowly concave; dorsal surface of fastigium and occipital medio-longitudinal carina as in related species: fastigio-facial angle in profile much as in *M. talamancae,* much sharper and more acute than in *M. fusiformis;* facial line nearly straight oblique retreating: frontal costa as seen in facial aspect with its carinae more regularly narrowing dorsad than in the allied species, ventrad proportionately narrower and more impresso-excavate than in its relatives: face and infra-ocular portion of head narrower even than in *M. talamancae,* the genal outlines straight and parallel as seen in cephalic aspect. Eyes as seen from dorsum set more obliquely and less transversely than in the closely allied species; occipital interocular space narrower than in related species. Antennae distinctly shorter than in *M. fusiformis* and *M. talamancae,* in length but slightly longer than the greatest depth of head, instead of from one and a third (*talamancae*) to one and a half times (*fusiformis*) the same; articles of antennae individually shorter than in other species.

Pronotum with its medio-dorsal line as seen in profile virtually straight, the median carina with but a hardly perceptible elevation at the caudal margin, no marked postmedian concavity of the carina indicated: in profile the arcuation of the lateral carinae of the disk is less decided and flatter.

Tegmina proportionately narrower at the base and more spatulate distad than in the related species.

Metanotum with its medio-longitudinal carina in profile rounded caudad, not angulately elevated near the caudal margin.

Cephalic and median limbs shorter and stockier than in related species. Caudal femora much less bullate and more slender than in *fusiformis* and *talamancae,* the dorsal line in particular straighter, less arcuate, the external face much narrower and in comparison distinctly deplanate; genicular extremity proportionately more slender, and the pregenicular narrowing less sharply indicated; ventro-external face less bullate than in the related species.

Allotype.— ♀ ; same data as type. [Academy of Natural Sciences of Philadelphia.]

The female exhibits differences from the same sex of *M. fusiformis* and *talamancae* in the same features as the male of *tristani* does from the corresponding sex of the above mentioned species. The following seem worthy of further explanation.

Pronotum with median carina faintly convex in cephalic half as seen in profile, when compared with male, but distinctly straighter than in the females of the related species.

Ovipositor valves slightly narrower more compressed than in the other species with which *tristani* has been compared.

Coloration as in *M. fusiformis,* the pattern virtually identical, but the contrasts are much less decided. The general impression is of a much duller insect, without as sharp definition and contrast of the proximo-dorsal pale area of the caudal femora and that on the tegmina as in *M. fusiformis*. The tegminal pale area is more encroached upon mesad by the blackish fuscous of the costal area than in *fusiformis*. The caudal tibiae, the venter of the caudal femora, the sterna and the ventral surface of the abdomen are as a whole more heavily and, except for pale tibial areas, more solidly infuscate than in *M. fusiformis*. The male individuals are more contrasted in coloration than the females, the latter being quite dull in tone, except for several from Navarro, which more nearly approximate the average contrast found in that sex of *M. fusiformis*.

Measurements (in millimeters)

	Length of body	Length of pronotum	Length of tegmen	Length of caudal femur
♂, La Palma, *type*	11.8	2.85	2.43	7.4
♂, Navarro, *paratype*	13.6	3.1	2.52	8.5
♂, La Carpintera, *paratype*	12.3	3.02	2.35	8.9
♀, La Palma, *allotype*.....	17.5	4.03	3.36	9.8
♀, Navarro, *paratype*	18.5	4.28	3.36	10.9
♀, La Carpintera, *paratype*	18.5	4.53	3.44	11.2

In addition to the type and allotype I have before me the following series, all the adults of which may be considered paratypes:

La Palma, between the volcanoes of Irazú and Barba, Costa Rica, elevation 5000 feet; July 28 and 29, 1927; (Tristán and Rehn; on low foliage in or along edge of cloud forest); one male, one female, four immature females: August 31 and September 1, 1923; (Tristán and Rehn; one in cloud forest and one in wet meadow at forest edge); one male, one female; [A. N. S. P.].

La Carpintera, Candelaria Mountains, Costa Rica, elevation 5100-6100 feet; September 4, 1923; (Lankester and Rehn; undergrowth and glades in heavy forest); three males, two females; [A. N. S. P.].

Navarro, north foot of the Candelaria Mountains, Costa Rica, elevation 3800-3950 feet; July 24, 1927; (Lankester and Rehn; on ground and on low foliage in heavy forest); three males, four females, two immature males, one immature female; [A. N. S. P.].

Pacayas, southeast slopes of Volcan de Irazú, Costa Rica, elevation 6250 feet; September 6, 1923; (Lankester and Rehn; along forest edge in undergrowth); one immature male; [A. N. S. P.].

The present species is a very distinct member of the Fusiformis Group, apparently limited in its distribution to the mountain slopes of the central area of Costa Rica. Like its relatives it is a forest form, inhabiting areas of virgin "montaña" which are drenched with cloud and fog nearly all or at least a considerable part of the year, a habitat in this respect quite different from that frequented by *M. talamanacae* and *M. f. fusiformis.* From the above listed specimens it will be seen that the vertical range of *M. tristani* extends from 3800 to 6250 feet, while areally the localities represented are included in a quadrangle less than twenty miles square. Whether the present species and *M. fusiformis lamprus,* the geographic race of that species from the interior, more elevated regions, are found under identical conditions or occupy distinct areal or environmental habitats remains to be determined, as our knowledge of *f. lamprus* is quite limited. The localities from which the latter form is known, have in large part been greatly altered by cultivation, and no primaeval areas occur there comparable to those found at the localities where *tristani* was secured.

It gives me great pleasure to dedicate this very distinct species to my friend and fellow-worker, Prof. J. Fidel Tristán, Director of the Liceo de Costa Rica at San José, who accompanied me on a number of excursions during two visits to Costa Rica, and whose kindness, encouragement and co-operation has done much to make my interest in the Orthoptera of that country deep and intimate.

Microtylopteryx hebardi Rehn

1905. *Microtylopteryx hebardi* Rehn, Proc. Acad. Nat. Sci. Phila., 1905, p. 448, figs. 40, 42. [♂, ♀; Carrillo, Costa Rica.]

The present species and *M. nigrigena* Hebard form a group of the genus sharply differentiated from the Fusiformis Group by their relative proportions, blunter head, broader and less produced fastigium, more slender form, more elongate jumping limbs, narrower tegmina, etc. For convenience I am calling it the Hebardi Group, although when our knowledge of the relationship of tropical American Cyrtacanthacrinae is more comprehensive, it may be necessary, for consistency, to utilize distinct genera for these group entities.

All the available material of *M. hebardi* is from the Santa Clara Plains of Costa Rica, where the species is a forest inhabitant, much more localized in its distribution than *M. f. fusiformis,* which occurs in the same region.

Hebard has indicated as the single (lectotypic) type of *Microtylopteryx hebardi* the male of the original type pair from Carrillo, which specimen is now type number 368 of the Hebard Collection.[40]

The specimens before me are as follows:

Carrillo, Costa Rica; four males, three females, *type, allotype* and *paratypes;* [Hebard Collection and A. N. S. P.].

Rio Guápiles, Costa Rica; June 5, 1909; (P. P. Calvert); one immature male; [A. N. S. P.].

Forest above La Emilia, near Guápiles, Costa Rica, elevation 1000 feet; August 12-25, 1923; (Rehn); ten males, ten females, nine immature females; [A. N. S. P.]: September 12-14, 1927; (Rehn); four males, two females, two immature males, three immature females; [A. N. S. P.].

All of the immature material before me represents the instar preceding maturity.

Microtylopteryx nigrigena Hebard

1924. *Microtylopteryx nigrigena* Hebard, Trans. Am. Ent. Soc., L, p. 137, pl. 6, fig. 18, pl. 7, fig. 8.[41] [♂, ♀; Gatun, Canal Zone, Panama.]

The original material of this species is before me, and I have nothing to add to the description. It might, however, be well to emphasize that the head of this species is not "longer . . . in proportion to the body bulk" as compared with *hebardi,* the depth instead being meant. The apparent greater depth is in proportion to the width and really due to the head being narrower and more compressed. The species is quite distinct from *hebardi* and the narrower tegmina alone would serve to distinguish it.

HYLOPEDETES[42] new genus

A very distinct genus of the Group Rhytidochrotae, for a summary of which see a recent paper by Hebard,[43] and related on one hand to *Opaonella* Hebard and on the other to *Piezops* of the same author. In general *Hylopedetes* is nearer *Opaonella,* from Colombia, differing chiefly in the less protuberant head, in the horizontal or moderately declivent instead of strongly declivent fastigium, in the interantennal production of the frontal costa being less decided and tumid, in the pronotum being less strumose between the more shallowly impressed transverse sulci, in the metazona being proportionately longer, in the less deplanate and different development of the mesonotum and metanotum, in the absence of evident auditory tympani, and in the character and sculpture of the ventral ovipositor jaws in the female. From *Piezops* Hebard, of Panama, the present genus differs in its non-ensiform antennae, less protuberant interantennal portion of the frontal costa, in the form of the fastigium, in the non-sulcate or at most faintly sulcate dorsal section of the frontal costa, in the more elongate and much less sellate pronotum, which has a much longer metazona and in profile lacks cephalic and caudal elevations, in the non-elevated caudal sections of the mesonotum and metanotum, in the less elongate limbs, in the less dentate and tuberculate character of the caudal femora, in the less strongly spined caudal tibiae and the more slender caudal tarsi.

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[40] Trans. Am. Ent. Soc., L, p. 137, (1924).

[41] Given erroneously as figure 9 at the head of the specific description and in the explanation of plates on page 140. Figure 9, plate 7 is of *Piczops ensicornis* (Stål).

[42] From ὑλη *forest* and πηδητής *a leaper.*

[43] Trans. Am. Ent. Soc., XLIX, pp. 294-307, (1923).

This is the first genus of the Rhytidochrotae to be known from north of Panama.

Generic Characters.—Apterous. Body fusiform to subfusiform in dorsal aspect. Head except for eyes not inflated or protuberant: fastigium subtrigonal in shape, in profile with dorsal line subhorizontal or moderately declivent; inter-antennal production marked but not exceptional in development, not or hardly longer than half of cephalo-caudal dimension of eye; frontal costa obsolete or subobsolete ventrad of median ocellus, dorsad plane or at most weakly sulcate; face in profile strongly retreating, concave. Eyes subglobose, inflated, moderately protuberant. Antennae simple, non-ensiform. Pronotum subsellate but in profile with dorsal line nearly straight; transverse sulci strongly indicated, distinctly incised; metazona with its surface much more finely impresso-punctulate than that of remainder of pro-, meso- and metanota and pleura: caudal margin of pronotal disk transversely bisarcuate or subtruncate, weakly emarginate mesad. Mesonotum and metanotum transversely arcuate, not strongly deplanate. Caudal margin of mesonotum weakly and of metanotum much more strongly concave mesad. Auditory tympana non-evident. Furcula of male very small; subgenital plate of male hardly produced. Ovipositor jaws with external margins armed distad with serrato-dentations, of ventral valves with a distinctly larger proximal tooth. Prosternal process low, transverse, bluntly nodose, non-spinose. Caudal femora moderately elongate, shorter than body: genicular lobes acute but non-spinose, a very short but distinct median spination present dorso-distad; margins of caudal femora very obsoletely and sparsely serrulato-denticulate; pattern of the pagina distinct and regular. Caudal tibiae armed on external margin with seven spines, no apical spine on this margin; spines of internal margin hardly longer than those of external margin. Caudal tarsi with third joint longer than first (metatarsal joint); arolia large; tarsal claws equal.

GENOTYPE: *Hylopedetes mirandus* new species.

Key to the Species of Hylopedetes

A. Fastigium with its dorsal surface bearing a distinct mediolongitudinal sulcation in both sexes; converging margins of the triangle of the fastigium appreciably constricted where they pass to frontal costa. Dorsal surface of fastigium in profile horizontal, forming an appreciable angle with the descending curve of occiput as it approaches the interocular constriction. Ovipositor valves relatively more robust in dorsal view. (Red markings not limited to a few paired spots on the metazona of the pronotum and on the pleura, instead suffusing whole dorsal surface of body or, when reduced, present at least as broad postocular bars extending to the base of the abdomen. Antennae not entirely dark.)

B. Form more robust. Eyes of male more prominent in cephalic aspect. Infra-ocular portion of head of female proportionately broader. Metazona of pronotum longer proportionately in both sexes, slightly longer than that portion of prozona between third and fourth transverse sulci. Caudal femora of female slightly more robust in proximal half. (Dorsal surface always greenish; caudal femora greenish with ochraceous genicular region.) *mirandus* new species

BB. Form more slender. Eyes of male less prominent in cephalic aspect. Infra-ocular portion of head of female proportionately narrower. Metazona of pronotum shorter proportionately in both sexes, slightly shorter or at least no longer than that portion of prozona between third and fourth transverse sulci. Caudal femora of female slightly more slender in proximal half. (Dorsal surface of male brilliant red, in female with middle greenish, encroached upon to a variable degree by lateral red; caudal femora uniform greenish or with ochraceous genicular region.) *cruentus* new species

AA. Fastigium with its dorsal surface without a marked medio-longitudinal sulcation in the female and but a very faint one in the male; margins of the triangle of the fastigium regularly converging distad without appreciable constriction. Dorsal surface of fastigium in profile appreciably declivent, in the female continuous with the cephalic descending curve of the occiput, in the male nearly so, the change of slant at the interocular constriction being very slight. Ovipositor valves relatively more slender in dorsal view. (Red markings represented only by a few paired spots on the metazona of the pronotum and on the pleura. Antennae entirely dark.)..............*gemmeus* new species

Hylopedetes mirandus[11] new species (Plate I, fig. 6, II, fig. 2, III, figs. 4 and 5, IV, figs. 12 and 14.)

The major differential features of this species are given in the above key. The insect is appreciably more robust than is *H. cruentus* when specimens are compared, the males as a whole heavier, the females more sturdily fusiform, while the caudal femora are distinctly deeper and more powerful. The color pattern is apparently distinctive, judging from the considerable series before me, showing no disposition to be as fluctuating as in *H. cruentus.*

Type.— ♂ ; La Emilia, near Guápiles, Costa Rica. Elevation 1000 feet. August 15, 1923. (Rehn; on undergrowth foliage in glade in heavy forest.) [Academy of Natural Sciences of Philadelphia, Type no. 5467.]

Size moderately small; general form as seen from dorsum weakly fusiform; surface of thoracic segments and proximal section of the abdomen punctulato-rugulose.

Head with occiput roundly elevated, regularly arcuate longitudinally over the occipital crown and descending to the constricted interocular space, which is but very faintly broader than the width of the fastigio-facial angle, in profile the slope of the dorsal surface of the fastigium is very appreciably more horizontal than and forms a distinct angle to the cephalad descending portion of the occiput: fastigium as seen from dorsum slightly acute trigonal, the apex rounded, greatest proximal width subequal to length caudad to least interocular width; surface of fastigium with a distinct but narrow medio-longitudinal sulcation; in profile the fastigial process is roundly produced between the antennal bases, the fastigio-facial angle distinct though narrowly rounded obtuse; cephalic aspect of process narrow, subconstricted dorsad and ventrad where it passes into the face, non-sulcate: facial line in profile strongly retreating, subconcave; surface of face shallowly sculptured; in cephalic aspect lateral margins of head ventrad of eyes are subparallel. Eyes prominent, moderately exserted, globose, greatest width in lateral view as 17 to 20 when compared with greatest length. Antennae equal to two-thirds of body in length.

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[11] I. e. *wonderful,* in allusion to the form and coloration of the species.

Pronotum with median carina indicated more cephalad on prozona and on metazona, subobsolete caudad on prozona, low, more distinctly defined on metazona than elsewhere; metazona of dorsum slightly longer than the portion of prozona between third and fourth transverse sulci; caudal margin of disk subtruncate, very broadly and shallowly obtuse-angulate emarginate mesad: lateral lobes with metazona subequal in width, caudal section of ventral margin largely truncate, obliquely arcuate but briefly caudad. Mesonotum subtruncate caudad, metanotum with same margin shallowly concavo-emarginate.

Furcula very short and broad trigonal, well separated, the area between broadly trigonal emarginate; supra-anal plate scutellate, the margins converging sigmoid, the apex narrowly acute, surface of plate narrowly sulcate mesad in its proximal two-fifths, broadly and shallowly subexcavate for the same distance caudad of furcula; cerci short, not quite reaching as far as apex of supra-anal plate, stout conical, apex bluntly acute; subgenital plate short, rounded, faintly conical as seen from dorsum, immediate apex broadly and coarsely sulcate in same view, in caudal aspect the sulcation gives a bimammillate appearance.

Caudal femora surpassing apex of abdomen by about combined length of head and pronotum, robust proximad, regularly narrowing from point of greatest width, which is at proximal fifth, to the pregenicular region of least width, greatest width contained four and one-half times in greatest length of femur (as 28 to 125); pattern of external pagina regularly, and distinctly but shallowly sculptured: caudal tibiae externally with seven spines: caudal tarsi with third joint nearly one and a half times as long as the first (metatarsal) joint (as 23 to 17).

Allotype.—♀ same data as type, but taken July 22, 1923. [Academy of Natural Sciences of Philadelphia.]

Differing from the above description of the male sex in the following noteworthy features.

Size medium; general form more distinctly fusiform.

Head with interocular space about one and one-half times as broad as the width at the fastigio-facial angle; in profile dorsal surface of fastigium is even more horizontal than in male and contrast with slope of cephalad descending portion of the occiput even more decided: fastigium in dorsal aspect more scutellate than in male, lateral margins more convergent from their middles distad than they are in proximal portion, the change in direction marked by an obtuse angulation; surface of fastigium with but a faint trace of a medio-longitudinal sulcation; in profile the fastigio-facial and facial lines are as in the male. Eyes proportionately smaller than in male, in lateral view slightly broader, the greatest width and greatest length as 19 to 21. Antennae relatively shorter, equal to one and one-half times the combined length of the head and pronotum.

Pronotum with median carina more evident immediately cephalad than elsewhere, the cephalic section of the pronotum faintly tectate dorsad. Mesonotum with distal margin appreciably, and metanotum with the same more strongly concavo-emarginate.

Abdomen more compressed than in male, medio-longitudinal carinato-tectation of dorsum more evident. Supra-anal plate acute trigonal, the proximal two-fifths sharply cut off in sculpture from the smoother distal three-fifths, median sulcation of proximal two-fifths as in male. Ovipositor valves relatively slender, as seen from dorsum faintly narrowing distad to middle, thence the external margin regularly bends inward toward the very acute apex; in profile the dorsal valves are subequally deep in proximal half, thence narrowing distad and moderately uncinate at apex; dorso-lateral margin of dorsal valves serrato-dentate in distal half, the margin obsolete proximad, dorso-internal margin continuous, faintly serrulate; dorsal surface distad concavo-deplanate, proximad roundly passing into lateral surface: ventral valves in form much as the dorsal valves inverted, ventro-lateral margins serrato-dentate with an appreciable proximal tooth. Subgenital plate subdeplanate ventrad, lateral portions of the plate vertical, forming a decided angle with ventral surface, non-carinate: plate narrowing in distal third, distal margin narrowly and briefly rectangulate produced between bases of ventral ovipositor valves.

Caudal femora surpassing apex of abdomen by about length of pronotum, greatest width contained nearly four and seven-tenths in greatest length of same (as 33 to 154): caudal tarsi with third joint faintly shorter proportionately compared with first (metatarsal) joint, the former being one and two-fifths times as long as the latter (as 28 to 20).

General color of dorsal surface ranging from light elm green to yew green, in the male sex never as dark as in the female; limbs, except the caudal tibiae and all the tarsi, bice green to jade green, rarely so darkened (possibly by drying and on caudal femora solely) as to be nearly dark cress green. Broad postocular bars reach from the eyes to and over much of the lateral aspects of the abdomen, these blackish fuscous on the head and on the pronotum and distad ranging from brilliant scarlet-red to nopal red, more contrasted in the male than in the female and always involving all of the pleura, all of the meso- and metasterna and tinging the ochraceous-orange to tawny ventral surface of the abdomen, laterad on the abdomen the postocular bars are separated from the dorsal coloration by a more or less evident bar of blackish fuscous, which is narrowly edged dorsad with wax yellow to honey yellow, this latter often carried similarly on the pronotum and head. Head with face dorsad to fastigium, genae, clypeus, mandibles and ventral section of lateral lobes of pronotum dorsad to lateral bars wax yellow to dull cadmium yellow; labrum generally approaching the green of the limbs; lateral aspects of the fastigial production blackish fuscous; antennae blackish fuscous, passing distad to pale ochraceous-orange; eyes russet to dresden brown. Tarsi paler than general limb coloration, the caudal tarsi distinctly chamois to cinnamon-buff. Caudal femora with entire genicular region ochraceous-buff to ochraceous-salmon, the lobes themselves faintly greenish. Caudal tibiae of the genicular color immediately proximad, followed by the green of the femora then passing into solid dark heliotrope-slate to dull violet black, which colors most of the tibiae; spines ochraceous, dark tipped.

Measurements (in millimeters)

	Length of body	Length of pronotum	Greatest total width of pronotum	Length of caudal femur
♂, *type*	13.5	2.68	2.52	10.7
♂, *paratype*	12.8	2.52	2.43	10.1
♀, *allotype*	19.6	3.27	2.77	13.9
♀, *paratype*	17.3	2.91	2.68	11.6

In addition to the type and allotype I have before me an interesting series all personally taken at the type locality and in the collection of the Academy, captured as follows: August 15, 1923, two males, six females, one immature male and one immature female; August 16, 1923, one male, six females, one immature male, one immature female; August 18, 1923, one female; August 20, 1923, one male; August 25, 1923, one immature male. All the adult individuals of this series are considered paratypes.

This species is an inhabitant of the heavy forest, where it occurs on low foliage in the glades or "sunlight holes." It is exceedingly active and not at all easy to capture in consequence, while its very striking coloration is exceptionally handsome.

The series of paratypes exhibits no noteworthy variational features in structure, except that the fastigial width is proportionately greater as compared with the length in certain individuals of both sexes. The color range has been covered in the above description. The immature individuals represent at least the three instars preceding maturity, the last of which is represented by one each taken August 15 and 16. The youngest individuals were taken August 15 and 25. The coloration of the immature individuals suggests the adults, but is lighter in tone and the scarlet-red is more nearly limited to the pleura and meso- and metasterna, extending but little on the pronotum and abdomen.

Hylopedetes cruentus new species[45] (Plate III, figs. 6-8.)

The features of *H. cruentus* have been given in the key to the species. It is a slightly but appreciably more slender insect than *mirandus* in both sexes, with a more compressed body, and also a different arrangement of the color pattern, the latter also showing a noteworthy and unexpected degree of variation in that of the caudal femora. While closely related to *H. mirandus* the present species should readily be recognized, and as far as known the two species do not occur in the same localities, *cruentus* being a form of generally higher levels.

Type.—♂; Navarro, Costa Rica. Elevation, 3800-3950 feet. July 24, 1927. (C. H. Lankester and J. A. G. Rehn; on foliage of low undergrowth in dense forest.) [Academy of Natural Sciences of Philadelphia, Type no. 5468.]

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[45] In allusion to the red color of much of the surface.

As the description of *H. mirandus* would apply in large part to the present species, the characters here given are essentially those which show noteworthy differences from the description of *mirandus*, or regarding which amplification is desirable.

Size smaller, form more compressed than in *mirandus*.

Head in profile with dorsal surface of fastigium somewhat less horizontal than in *mirandus*, being appreciably declivent yet forming an appreciably angle with the cephalad descending portion of the occiput: fastigium as seen from dorsum forming a short triangle cephalad of point of greatest width, the latter being equal to the fastigial length caudad to a point of least interocular width; surface of fastigium with a distinct but narrow medio-longitudinal sulcation, which reaches caudad to least interocular width; in profile the fastigial process is seen to be slightly less roundly produced between the antennal bases than in *H. mirandus;* in cephalic aspect the head ventrad of eyes is seen to be weakly narrowing ventrad toward mouth-parts; sculpturing of face more deeply indicated than in *H. mirandus*. Eyes as in *mirandus* but slightly less prominent and elevated when seen in cephalic aspect.

Pronotum with median carina less evident than in *mirandus*, subobsolete except on metazona; transverse sulci of pronotum more deeply and sharply indicated, the areas between more roundly subinflated and less deplanate than in *mirandus;* metazona of pronotum slightly shorter than that portion of prozona between third and fourth transverse sulci; caudal margin of pronotum as a whole very broadly and weakly obtuse-angulate emarginate: lateral lobes of pronotum with metazona regularly widening ventrad; caudal section of ventral margins hardly arcuate.

Abdomen somewhat more compressed than in *mirandus*. Furcula reduced to very small, shining black nodes or points, separated by a very shallow and broad obtuse-angulate emargination: supra-anal plate trigonal, shorter than in *mirandus* with the margins regularly converging to the apex, which is bluntly rounded and less acute than in *mirandus*, median sulcation shorter than in *mirandus*, the surface hardly excavate distad of the furcula; cerci as in *mirandus* but faintly longer; subgenital plate blunter than in *mirandus*, more curved dorso-cephalad than in the other species, median sulcation reduced to a mere notch in the margin.

Caudal femora as in *mirandus* except for the more slender form, the greatest width contained four and two-fifths times in greatest femoral length (as 24 to 115); caudal tibiae and tarsi much as in male of *mirandus*, third tarsal joint slightly more than one and one-half times as long as first (metatarsal) joint (as 20 to 13).

Allotype.— ♀ ; same data as type. [Academy of Natural Sciences of Philadelphia.]

Differing from the description of the male sex, and the female of *H. mirandus* in the following noteworthy features.

Size smaller, form less robust than in female of *mirandus.*

Head with fastigium in profile having the declivity of dorsal surface and its relation to the slope of the cephalad descending portion of the occiput as in the male sex, in dorsal view the fastigium is similar in proportions to that of male sex, the medio-longitudinal sulcation weaker than in male; in cephalic aspect the head ventrad of eyes has the lateral margins straight, faintly converging ventrad; sculpturing of face similar to that of male. Eyes slightly less prominent in dorsal and cephalic aspects than in the female of *H. mirandus.*

Pronotum having the same general proportions found in the male sex, but more appreciably widening caudad; median carina briefly evident cephalad on prozona; transverse sulci narrower and less channeled than in male but deeply and strongly indicated; caudal margin of pronotum more nearly transverse truncate than in male, median emargination very shallowly indicated; lateral lobes of pronotum with metazona but faintly widening ventrad.

Abdomen with carinato-tectation of tergites less strongly indicated than in *H. mirandus.* Supra-anal plate as in *mirandus.* Ovipositor valves much as in *H. mirandus*, dorsal valves with dorso-external margins having the serrato-dentations coarser and fewer, the series extending a greater distance proximad than in *mirandus*: ventral valves with serrato-dentations coarser and fewer, proximal tooth well developed. Subgenital plate much as in *H. mirandus.*

Caudal femora surpassing apex of abdomen by about half the length of pronotum, greatest width contained nearly four and three-fifths times in greatest length of same (as 29 to 132). Caudal tarsi with third joint over one and one-half times as long as first (metatarsal) joint (as 25 to 16).

General color of dorsal surface of pronotum, dorsal section of lateral lobes of pronotum, mesonotum, metanotum, most of pleura and dorsal surface of proximal two-thirds of abdomen nopal red to carmine, gradually passing distad on abdomen into parrot green to cedar green. The same red color in the female is limited to dorso-lateral longitudinal bars, not reaching the head and becoming obsolete at the middle of the abdomen, sometimes (two specimens) nearly meeting dorsad across the central portion of the pronotum, in the female the other portions of the area which is nopal red to carmine in the male are parrot green or grass green to cedar green. The head of male dorsad may be of the dorsal red color or it may be dull yew green to bottle green, in which case the red of the postocular areas of the head is similarly replaced; genae, face, mouth-parts and ventral borders of lateral lobes of pronotum in these male individuals and in all the females are antimony yellow to mustard yellow; in the brilliantly red males the whole head, except for the mouthparts, is uniformly nopal red to carmine. Eyes ranging from raw sienna, through amber brown and argus brown to raw umber. Antennae with proximal joint at least in part greenish, thence ranging from blackish fuscous narrowly red at tips to entirely brazil red with second joint alone blackish fuscous. Brilliantly red males with meso- and metasterna and ventral surface of abdomen washed with vivid nopal red; other males and females have this area dull ochraceous-buff. Cephalic and median limbs lettuce green to parrot green; caudal femora parrot green to cedar green, with genicular arches alone olivaceous, or the entire genicular region is ochraceous-salmon with an evident but imperfectly defined pregenicular annulus of jasper red; caudal tibiae immediately proximad of the color of the genicular region of the femora when same is contrasted, thence green to cedar green becoming dull bluish green distad, or the entire tibiae except spines and proximal section is largely washed with dark dull violet-blue, spines buffy, tipped with blackish fuscous; caudal tarsi of the green of the caudal femora or more yellowish green, or of the violet blue of the tibiae in those individuals so suffused.

It would seem from the specimens before me that we have recessive and intensive phases of coloration in this species. In the former, as represented by Carrillo individuals, the red of the dorsum is much less extensive, does not solidly mantle that surface and the apices of the caudal femora are not contrastingly colored. In the intensive phase, strongly represented by all the Navarro males and less markedly so by the allotype, the dorsal red is solid, colors all of head, nearly all of antennae and the caudal femoral apices are contrastingly colored.

Measurements (in millimeters)

	Length of body	Length of pronotum	Greatest total width of pronotum	Length of caudal femur
♂, Navarro, *type*	12.9	2.35	2.26	9.9
♂, Carrillo, *paratype*	13.8	2.52	2.35	10
♀, Navarro, *allotype*	18.6	2.91	3.19	11.2
♀, Carrillo, *paratype*	19.2	3.19	3.36	13

In addition to the type and allotype I have before me two adult males and one immature female taken with the type, from the collection of the Academy; two males and four females, taken at Carrillo, Costa Rica, by Underwood, from the Hebard Collection; and one immature male and one immature female taken at La Palma, Costa Rica, between the Volcanoes of Irazú and Barba, 4960-5100 feet elevation, (Tristán and Rehn; in low vines and tangles along edge of forest), September 1, 1923. One male and one female from Carrillo bear the date, June, 1903, the others from that locality lack capture dates. All the adult specimens I am considering paratypes. I have commented above upon the color variation in the species and the measurements show the amount of size variation. At first examination the Carrillo and Navarro specimens would seem distinct on account of the different femoral coloration, but no visible structural features support these differences, which I feel are not specific. The La Palma immature specimens are in the instar preceding maturity, while that from Navarro is one instar younger. In the La Palma immature specimens the reddish wash, while relatively weak, covers virtually all of the dorsal surface of the thoracic segments and of the proximal section of the abdomen. That from Navarro has the dorsal reddish much more limited to postocular areas, but the face, genae and antennae are quite deeply red, while the face and genae are yellow and the antennae fuscous in the La Palma immatures.

The species is one of the heavy forest, and as above records show has a vertical range of about four thousand feet, i. e. from but slightly above one thousand feet at Carrillo, to five thousand feet at La Palma. The types of forest inhabited by the species at Navarro and La Palma are quite different in character. The latter is a fog soaked mountain cloud forest, while that at Navarro is less subject to constant saturation.

Hylopedetes gemmeus[46] new species (Plate IV, figs. 11 and 13.)

In the key to the species of the genus I have given the more important features of difference of *gemmeus* from the other species here described. The fastigial form, the greater interocular width and the very distinctive type of thoracic coloration should enable the student to recognize the species readily.

Type.—♂ ; Navarro, Costa Rica. Elevation, 3800-3950 feet. July 24, 1927. (C. H. Lankester and J. A. G. Rehn; on foliage of low undergrowth in dense forest.) [Academy of Natural Sciences of Philadelphia, Type no. 5469.]

As the general structure of this species is much the same as that of *H. mirandus* and *cruentus* already described, the features here given are essentially differential, being those more evident and in character or degree of comparative importance.

Size and general form as in *H. cruentus.*

Head with fastigium as seen from dorsum acute trigonal, slightly longer from least interocular width than greatest fastigial width (as 10 to 9), immediate apex distinctly transverse truncate, lateral margins regularly straight convergent, surface of fastigium with a very faint medio-longitudinal sulcation, obsolete caudad on fastigium; interocular width relatively great, equal to nearly two-fifths of greatest fastigial width (as 3.5 to 9); in profile dorsal line of fastigium is seen to be appreciably declivent, regularly rounding to the arcuate fastigio-facial angle and proximad forming but a slight angle with the cephalad descending portion of the occipital swelling; interantennal production as in other species, but cephalic aspect broader and deplanate, non-sulcate; face with sculpture as in *H. mirandus,* much less evident in *cruentus;* lateral margins of head ventrad of eyes, as seen in cephalic aspect, subparallel. Antennae incomplete. Eyes slightly more inflated than in *H. cruentus* when seen from dorsum, much more so than in *H. mirandus.*

Pronotum in general as in *H. cruentus* but metazona faintly longer than portion of prozona between third and fourth transverse sulci, and median carina evident cephalad but obsolete elsewhere; lateral lobes with metazona equal in width, not widening ventrad as in *cruentus,* ventral margin of lobes in caudal half regularly arcuate to the distinct and evident obtuse ventro-caudal angle.

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[46] I. e. *set with gems,* in allusion to the brilliancy of the coloration in life.

Furcula minute points as in *cruentus*: supra-anal plate scutellate in shape as in *H. mirandus*, but apex not as acutely produced and the surface hardly excavate for a very brief and narrow proximal medio-longitudinal sulcation: cerci as in *H. mirandus* but slightly longer and sharper: subgenital plate with apex very finely incised for a short distance, the cleft not at all open in type, this area in caudal aspect being more conical than in the related species.

Caudal femora faintly more robust than in *H. cruentus*, greatest width contained nearly four and three-fifths times in greatest length (as 24 to 115): caudal tarsi with third joint more than one and one half times as long (ratio 23 to 14) as first (metasternal) joint.

Allotype.— ♀ ; same data as type. [Academy of Natural Sciences of Philadelphia.]

The following features are sufficiently different from those given for the male sex to require emphasis.

Size as in female of *H. cruentus;* form as in same sex of *cruentus* but slightly more robust.

Fastigium as seen from dorsum more equilateral in its trigonal outline than in male, the greatest width being slightly more than length from least interocular space (as 12 to 10), the lateral margins equally straight oblique, distal section similarly transverse truncate but less markedly so on account of the broader form; interocular width of same relative width as in male; in profile dorsal line of fastigium is more markedly declivent than in female, continuous with slope of cephalic descending portion of occipital dome; fastigio-facial angle more obtuse than in male.

Pronotum with median carina appreciably indicated caudad to fourth transverse sulcus; caudal margin of disk of pronotum very gently and broadly arcuate produced with a very broad and shallow median emargination.

Supra-anal plate as in *H. cruentus.* Ovipositor valves as seen from dorsum more slender and compressed than in *H. cruentus*, external margins in distal half more gradually and less sharply converging to apices, teeth of same margin being less regular, while in lateral aspect the entire dorsal valves more gradually narrow in distal half: ventral valves as seen in ventral aspect proportionately as narrow as are the dorsal valves, when compared with those of *H. cruentus.*

Caudal tarsi with third joint one and two-thirds times as long as first (metatarsal) joint (ratio 25 to 15).

General color of dorsal surface lettuce green to oil green, passing to yellowish olive or brownish olive on the abdomen; incomplete postocular bars of dusky olive-green to dusky dull green extending brokenly to proximal portion of abdomen, little evident on pronotum or pleura. Face, genae, most of mouth-parts, ventral portion of lateral lobes of pronotum, coxae, sterna and much of venter of abdomen maize yellow to light orange-yellow, the darker tone in the female and on the ventral surface only. Eyes dresden brown to liver brown. Antennae entirely blackish fuscous except for proximal joint, which is in part of the dorsal green. Narrow, broken and irregular patches of maize yellow to dull ochraceous-buff (abdomen of male) dorsad border the postocular bars, evident on head and proximal section of abdomen in both sexes, irregularly indicated on pronotum of female, obsolete on pronotum of male; dorsal two-thirds of metazona of lateral lobes, narrowly caudad extending to dorsal surface, and in male narrowly extending cephalad of fourth transverse sulcus, scarlet, faintly weaker in female than in male, also coloring most of mesopleura in both sexes. Limbs of the dorsal green, the color of the tibiae particularly deep and clear translucent; genicular arches of caudal femora bister to brownish olive; tibial spines greenish white, tipped with blackish fuscous; tarsi in part washed with olivaceous brown.

Measurements (in millimeters)

	Length of body	Length of pronotum	Greatest width of pronotum	Length of caudal femur
♂	13.1	2.39	2.43	10
♀	18.7	3.36	3.36	12.2

The type and the allotype are the only specimens of this distinctive species which I have seen. They were taken in the same general vicinity as the Navarro specimens of *H. cruentus,* and the two species probably have much the same habits.

EXPLANATION OF PLATES

PLATE I

Fig. 1.—*Ophthalmolampis bradleyi* new species. Lateral outline of head and pronotum of female (type). Suretka Trail, Costa Rica. (X 5.)

Fig. 2.—*Ophthalmolampis bradleyi* new species. Outline of caudal limb of female (type). Suretka Trail, Costa Rica. (X 4.)

Fig. 3.—*Ophthalmolampis bradleyi* new species. Lateral view of apex of abdomen of female (type). Suretka Trail, Costa Rica. (X 10.)

Fig. 4.—*Ophthalmolampis bradleyi* new species. Ventral view of disto-ventral sternite (subgenital plate) of female (type). Suretka Trail, Costa Rica. (X 10.)

Fig. 5.—*Lithoscirtus nebulicola* new species. Dorsal view of apex of abdomen of female (allotype). La Palma, Costa Rica. (Greatly enlarged.)

Fig. 6.—*Hylopedetes miranda* new genus and species. Ventral view of apex of abdomen of female (allotype). La Emilia, Costa Rica. (Greatly enlarged.)

Fig. 7.—*Nicarchus enyalius* new species. Dorsal view of male (type). La Emilia, Costa Rica. (X 3.)

Fig. 8.—*Nicarchus enyalius* new species. Lateral view of male (type). La Emilia, Costa Rica. (X 3.)

PLATE II

Fig. 1.—*Ophthalmolampis bradleyi* new species. Dorsal view of female (type). Suretka Trail, Costa Rica. (X 4.)

Fig. 2.—*Hylopedetes miranda* new genus and species. Dorsal view of female (allotype). La Emilia, Costa Rica. (X 4.)

Fig. 3.—*Guetaresia lankesteri* new genus and species. Lateral view of female (type). Peralta, Costa Rica. (X 3.) [Fastigium and dorsum of head and pronotum in part restored.]

Fig. 4—*Guetaresia lankesteri* new genus and species. Outline of antenna of female (type). Peralta, Costa Rica. (X 4.)

Fig. 5.—*Guetaresia lankesteri* new genus and species. Cephalic view of head of female (type). Peralta, Costa Rica. (X 3.) [Fastigium partly restored.]

PLATE III

Fig. 1.—*Lithoscirtus daedalus* new species. Lateral outline of male (type). Navarro, Costa Rica. (X 4.)

Fig. 2.—*Lithoscirtus nebulicola* new species. Lateral outline of male (type). La Palma, Costa Rica. (X 4.)

Fig. 3.—*Lithoscirtus viceitas* new species. Outline of caudal limb of male (type). Suretka Trail, Costa Rica. (X 4.)

Fig. 4.—*Hylopedetes miranda* new genus and species. Outline of male (type). La Emilia, Costa Rica. (X 4.)

Fig. 5.—*Hylopedetes miranda* new genus and species. Cephalic view of head of male (type). La Emilia, Costa Rica. (X 4.)

Fig. 6.—*Hylopedetes cruentus* new genus and species. Dorsal outline of head and pronotum of male (type). Navarro, Costa Rica. (X 4.)

Fig. 7.—*Hylopedetes cruentus* new genus and species. Cephalic view of head of female (allotype). Navarro, Costa Rica. (X 4.)

Fig. 8.—*Hylopedetes cruentus* new genus and species. Outline of caudal femur of female (allotype). Navarro, Costa Rica. (X 4.)

PLATE IV

Fig. 1.—*Lithoscirtus miniatulus* (Rehn). External view of left cercus of male (paratype). Carrillo, Costa Rica. (Greatly enlarged.)

Fig. 2.—*Lithoscirtus viceitas* new species. External view of left cercus of male (type). Suretka Trail, Costa Rica. (Greatly enlarged.)

Fig. 3.—*Lithoscirtus daedalus* new species. External view of left cercus of male (type). Navarro, Costa Rica. (Greatly enlarged.)

Fig. 4.—*Lithoscirtus nebulicola* new species. External view of left cercus of male (type). La Palma, Costa Rica. (Greatly enlarged.)

Fig. 5.—*Lithoscirtus miniatulus* (Rehn). Distal aspect of left cercus of male (paratype). Carrillo, Costa Rica. (Greatly enlarged.)

Fig. 6.—*Lithoscirtus viceitas* new species. Distal aspect of left cercus of male (type). Suretka Trail, Costa Rica. (Greatly enlarged.)

Fig. 7.—*Lithoscirtus daedalus* new species. Distal aspect of left cercus of male (type). Navarro, Costa Rica. (Greatly enlarged.)

Fig. 8.—*Lithoscirtus miniatulus* (Rehn). Dorsal aspect of left cercus of male (paratype). Carrillo, Costa Rica. (Greatly enlarged.)

Fig. 9.—*Lithoscirtus viceitas* new species. Dorsal aspect of left cercus of male (type). Suretka Trail, Costa Rica. (Greatly enlarged.)

Fig. 10.—*Lithoscirtus nebulicola* new species. Dorsal aspect of left cercus of male (type). La Palma, Costa Rica. (Greatly enlarged.)

Fig. 11.—*Hylopedetes gemmeus* new genus and species. Dorsal view of fastigium of male (type). Navarro, Costa Rica. (Greatly enlarged.)

Fig. 12.—*Hylopedetes miranda* new genus and species. Lateral view of fastigium and eye of female (allotype). La Emilia, Costa Rica. (Greatly enlarged.)

Fig. 13.—*Hylopedetes gemmeus* new genus and species. Lateral view of fastigium and eye of female (allotype). Navarro, Costa Rica. (Greatly enlarged.)

Fig. 14.—*Hylopedetes miranda* new genus and species. Dorsal outline of (type). La Emilia, Costa Rica (X 4.)

Fig. 15.—*Lithoscirtus daedalus* new species. Dorsal view of left cercus of male (type). Navarro, Costa Rica. (Greatly enlarged.)

PLATE V

Fig. 1.—*Microtylopteryx tristani* new species. Lateral view of male (type). La Palma, Costa Rica. (X 5.)

Fig. 2.—*Microtylopteryx tristani* new species. Cephalic aspect of head of male (type). La Palma, Costa Rica. (X 5.)

Fig. 3.—*Microtylopteryx fusiformis fusiformis* (Rehn). Cephalic aspect of head of male. La Emilia, Costa Rica. (X 5.)

Fig. 4.—*Microtylopteryx fusiformis lamprus* new subspecies. Cephalic aspect of head of male (type). Monte Redondo, Costa Rica. (X 5.)

Fig. 5.—*Microtylopteryx talmancae* new species. Cephalic aspect of head of male (type). North end of Suretka Trail, Costa Rica. (X 5.)

Fig. 6.—*Microtylopteryx talamancae* new species. Lateral view of pronotum of male (type). North end of Suretka Trail, Costa Rica. (X 4.)

Fig. 7.—*Microtylopteryx fusiformis fusiformis* (Rehn). Lateral view of fastigium of male. La Emilia, Costa Rica. (Greatly enlarged.)

Fig. 8.—*Microtylopteryx talamancae* new species. Lateral view of fastigium of male (type). North end of Suretka Trail, Costa Rica. (Greatly enlarged.)

Fig. 9.—*Microtylopteryx talamancae* new species. Lateral view of fastigium of female (allotype). North end of Suretka Trail, Costa Rica. (Greatly enlarged.)

Fig. 10.—*Microtylopteryx tristani* new species. Lateral view of fastigium of female (allotype). La Palma, Costa Rica. (Greatly enlarged.)

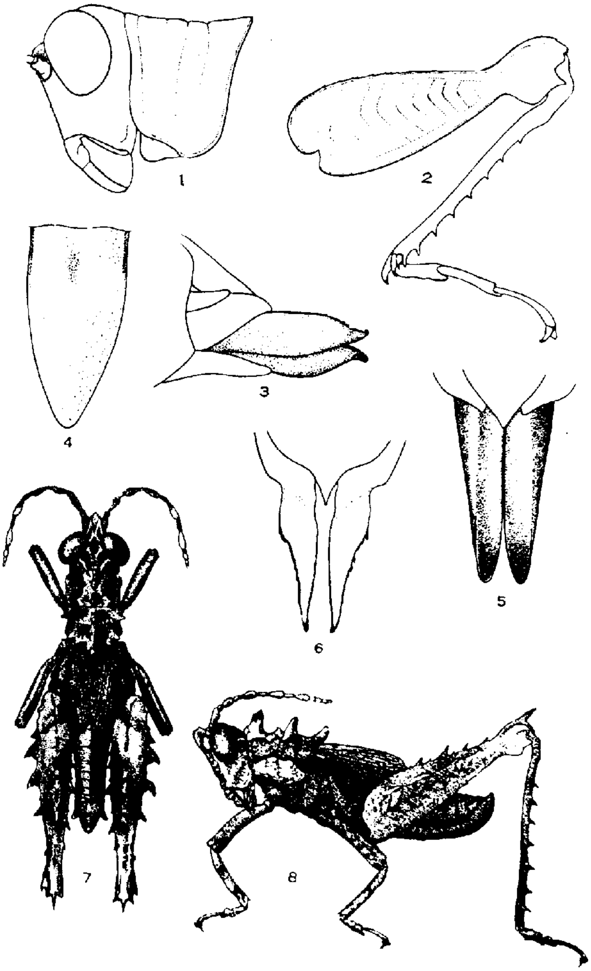
Fig. 11.—*Microtylopteryx fusiformis fusiformis* (Rehn). Dorsal view of fastigium of male. La Emilia, Costa Rica. (Greatly enlarged.)

Fig. 12.—*Microtylopteryx talamancae* new species. Dorsal view of fastigium of male (type). North end of Suretka Trail, Costa Rica. (Greatly enlarged.)

Fig. 13.—*Microtylopteryx talamancae* new species. Dorsal view of fastigium of female (allotype). North end of Suretka Trail, Costa Rica. (Greatly enlarged.)

Fig. 14.—*Microtylopteryx tristani* new species. Dorsal view of fastigium of male (type). La Palma, Costa Rica. (Greatly enlarged.)

Fig. 15.—*Microtylopteryx tristani* new species. Dorsal view of fastigium of female (allotype). La Palma, Costa Rica. (Greatly enlarged.)



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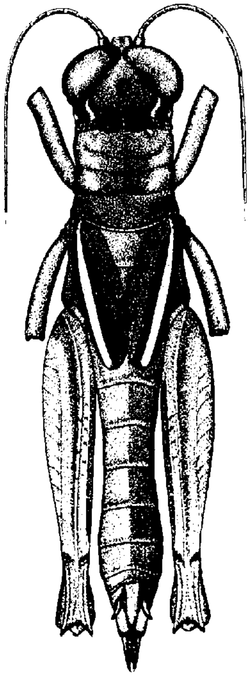

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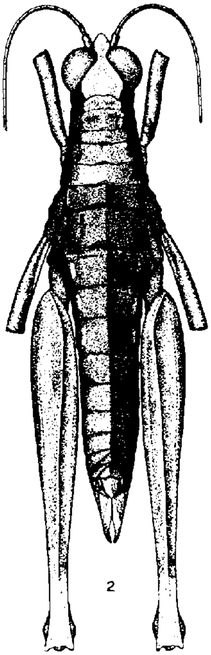

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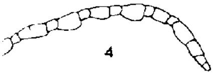

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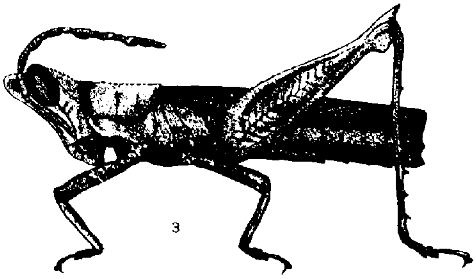

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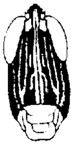

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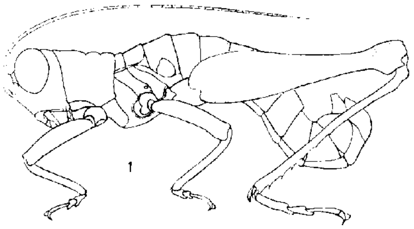
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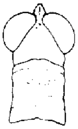
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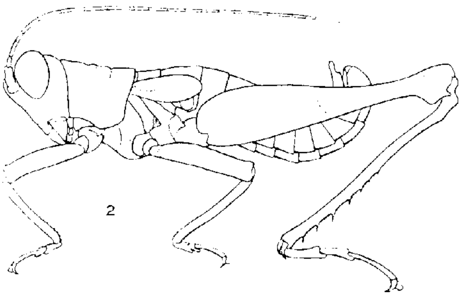
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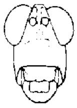
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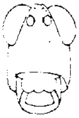
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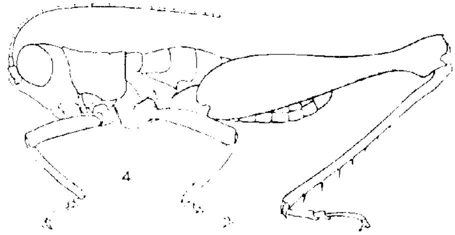
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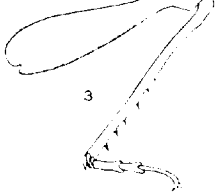
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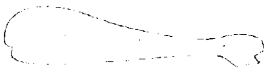
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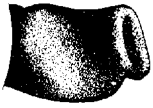

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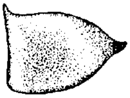

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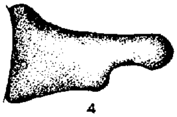

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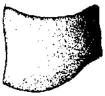

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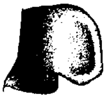

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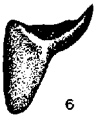

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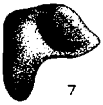

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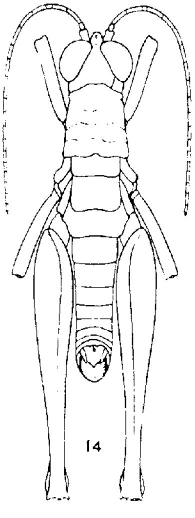

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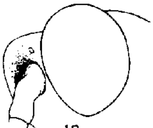

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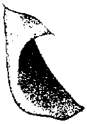

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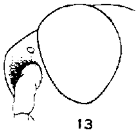

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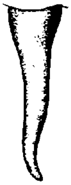

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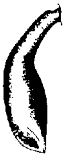

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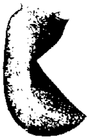

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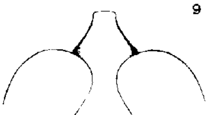

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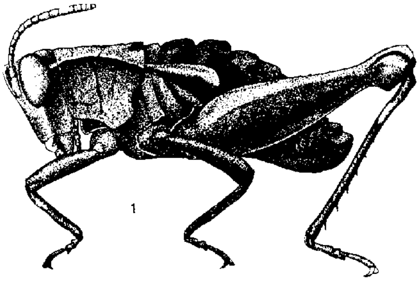
REHN COSTA RICAN ORTHOPTERA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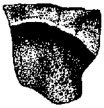
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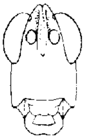
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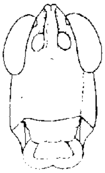
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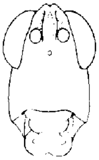
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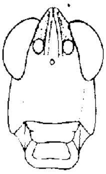
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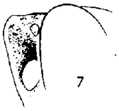
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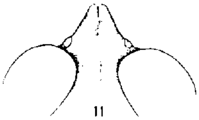
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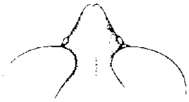
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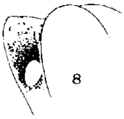
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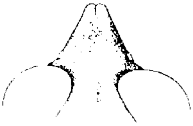
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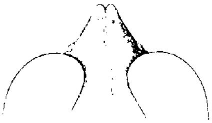
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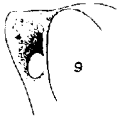
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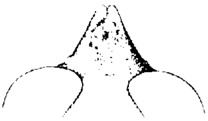
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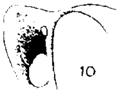
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REHN—COSTA RICAN ORTHOPTERA

LARVAL DEVELOPMENT OF SYMPETRUM VICINUM

(ODONATA: LIBELLULIDAE; SYMPETRINI)

BY F. REESE NEVIN

University of Pennsylvania, Philadelphia

The purpose of this study was to note the structural features which characterize the larvae of *Sympetrum vicinum* in its various stages of development in order to identify the instars and to be able to distinguish *vicinum* from other Sympetrini.

HISTORICAL DATA

The nymph of *Sympetrum vicinum* was described by Dr. James G. Needham and Cornelius Betten (1901). Dr. E. M. Walker (1917) described and figured the last larval instar. Dr. Philip Garman (1927) gives a complete description of the last larval instar based on several exuviae and one full grown nymph. These are the only accounts of the nymph of which we have any knowledge.

A study of a nature somewhat similar to the following was made of the earlier instars of *Pantala flavescens*, one of the Trameini, by Laura Lamb (1925).

The writer wishes to express his thanks to Dr. Philip P. Calvert, who suggested the problem, for help and criticism.

MATERIALS AND METHODS

The materials used — larvae and their exuviae — developed from eggs laid by five individuals collected over the pond in the Botanical Gardens of the University of Pennsylvania by Dr. Calvert on October 1, 1927. Larvae were first observed on November 28. The newly hatched larvae to be studied were placed each in a stender dish which contained water with some plant material kept at about 21°C. The larvae not placed in stender dishes were left in the tumbler where they lived several days and where eggs continued to hatch. The last living specimen was taken from the tumbler on January 23, 1928.

Greatest mortality occurred among the young larvae. Only five individuals passed the second instar. One of these died in the third. The other four transformed or died in the act of transformation after having passed through eleven instars. The exuviae and dead larvae were kept in alcohol in separate vials. The adults and last exuviae were kept dry.

Food Supplied

During the first instar specimens from a Protozoan culture were placed in the stender dishes. This culture proved to be mainly of *Paramecium aurelia* which were so small that the larvae did not seem to notice them and continued to die, probably from starvation. At death the linings of the foregut and the hindgut were seen projecting from the larvae. When *Paramecium caudatum* were fed, the larvae ate them quite greedily. Another mixed culture used at this time ontained many Stylonychias and a few Vorticellas although the larvae were never seen to eat the latter except with Daphnia to which Vorticellas were attached. Later many Rotifers were present in this culture. Several Ostracods of the family Cyprididae were eaten before the first molt. Later, larger Ostracods and Copepods including Cyclops and Diaptomus, were eaten. The Copepods proved more proficient in capturing Paramecia than the dragonfly larvae and had to be removed until the larvae were larger. They also destroyed the exuviae of *vicinum* or parts of them if the latter were left too long after the individuals had molted. During the last few instars Daphnia, Hyallela and small Mayfly and Stonefly larvae were fed. Daphnias were not eaten from choice, but formed an important part of the food especially when Mayfly larvae were not at hand.

All larvae were fed and cared for three times each week, on Monday, Thursday and Saturday.

Constant Characters

The following characteristics are common to all instars: The eyes are large and approach one another only in last instar when the facets of the compound eyes of the adult can be clearly seen through the chitin; the movable hook is long and slender; hairlike setae are present on the vertex and many on the ventral surface of the ninth abdominal segment especially noticeable from the fourth instar on; the entire body, including the legs, bears many hair-like setae except in the last instar, when few are noticeable, but shorter spine-like setae are present especially on the tibiae; each tarsus terminates in two claws; the antennae and legs are banded with very light brown in early instars—this becomes a somewhat darker brown in later instars and differs slightly in different individuals; the abdomen in later instars is noticeably flattened on the ventral surface.

Duration of Instar

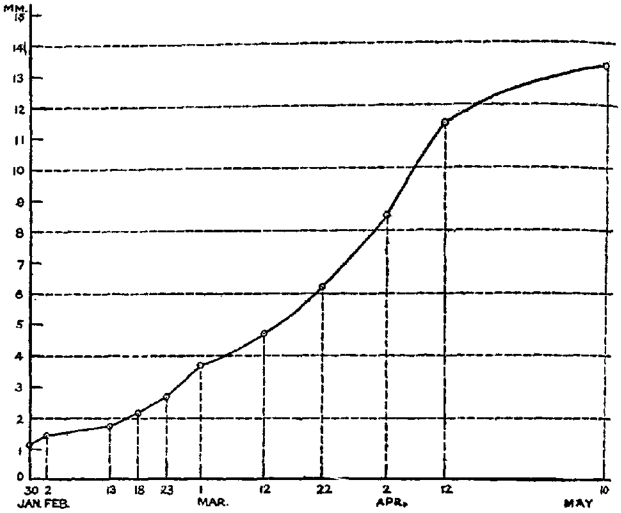
Dates, on which exuviae of the four individuals which passed to maturity were found, are listed below; the original number given each is retained.

No. of Exuvia	Larva No. 1	Larva No. 3	Larva No. 8	Larva No. 11
1	Jan. 26	Jan. 30	?	Jan. 30
2	Feb. 2	Feb. 2	?	Feb. 2
3	Feb. 16	Feb. 13	Jan. 28	Feb. 13
4	Feb. 18	Feb. 16	Feb. 6	Feb. 18
5	Feb. 25	Feb. 18	Feb. 16	Feb. 23
6	Mar. 3	Feb. 25	Feb. 23	Mar. 1
7	Mar. 10	Mar. 5	Mar. 3	Mar. 12
8	Mar. 22	Mar. 19	Mar. 15	Mar. 22
9	Mar. 29	Apr. 2	Mar. 24	Apr. 2
10	Apr. 9	Apr. 12	Apr. 4	Apr. 12
11	May 4	May 7	May 3	May 10

These four larvae were placed in stender dishes on the following dates: Numbers 1, 8 and 11 on January 4, number 3 on January 23. No molts were recorded before January 26 although number 8 must have molted twice before January 28. The exuviae may have been destroyed by Copepods.

The rate of growth of larva number 11 is shown on accompaning graph, but the length of newly-hatched larvae was obtained from ten living *vicinum* larvae, from eggs collected by Dr. Calvert on October 10, 1928, and measured on December 17. The average length was 0.990 mm., the range was from 0.993 to 1.040 mm. The eggs began hatching on December 13.

The duration of instars varied greatly from two days, in the fourth instar of larva number 1 and in the fifth instar of larva number 3, to nearly a month in the first and last instars. There seemed to be little correlation between the different individuals in the length of instars except in the first and last instars which in each case were much longer than the other instars. The first moulting was probably retarded by scarcity of food. When much food material was present as in the third, fourth and fifth instars the duration of the instars was shortened. This leads to another noticeable fact, i. e. the adult appeared more than a month earlier than ever before recorded in nature. The earliest date on which the adult has been observed was on June 24, 1898, at Round and Shriner Lakes in Indiana by E. B. Williamson. Dr. Calvert has recorded the presence of adults in the vicinity of Philadelphia from July 11 to November 23. The latter date we believe to be the latest date on record on which this species has been observed. We were unable to obtain vicinum larvae by dredging the pond in the Botanical Gardens in the spring and early summer of 1928.



Growth Curve in length for *Sympetrum vicinum* larva Number 11. The points within the small circles represent the molts.

Measurements

In the following account all measurements were made on the exuviae and show the range in millimeters in four, sometimes three individuals. In many cases a part of an exuvia was broken and in a few cases only a fraction of it was left. In such cases all measurements possible have been made. Measurements of the width of the eyes and sometimes of the abdominal segments cannot be accurate because of the difficulty of preserving the exact shape of the exuviae. The reason for the apparent variation in the lengths of the lateral and superior appendages seems to be due to the fact that in the first instar spines at the end of these appendages are quite long and slender these become relatively shorter and stouter in later instars. The points of these appendages seem in many cases to have been broken off. In this report the first antennal joint is the proximal joint. In stating the number of mental and lateral setae the most common number of setae is given. In many cases one palp will possess more lateral setae than the other and one-half of the mentum will bear more mental setae than the other.

Formula for the Mandibles

In every instar each mandible is armed with two rows of teeth, apical and proximal. In addition to these, in later instars, each mandible has a denticle on its posterior margin. If we designate the apical teeth, beginning at the posterior margin of the mandible, by arabic numerals, the proximal by a—d and the denticles by y, and the absence of the denticle by 0, we obtain a table which concisely states the armature of the mandibles. For example, in the last instar we find that the following table holds true:

Right mandible		Left mandible	
Apical teeth	1, 2, 3, 4	Apical teeth	1, 2, 3, 4
Posterior denticle	y	Posterior denticle	y
Proximal teeth	a, b, d	Proximal teeth.........	a, b

This data may be written as a formula, as: $\frac{\text{R-1,2,3,4,y,a,b,d}}{\text{L-1,2,3,4,y,a,b}}$

In like manner the formulae for all instars have been worked out and included in the report. In the numbering and lettering of the teeth and denticles the method used by Dr. Calvert as indicated on pages 15 and 16 of his "Report" (1928) has been adopted.

Outline of Changing Characters

POINTS DIFFERENTIATED	Number in the following lists
1. Length of larval exuvia	1
2. Head	
a. Size	
Length	2
Width	3
b. Width of eyes compared with width of head	4
c. Length of horns on vertex of head	5
d. Antennae	
Number of joints	6
Length of joints	7
e. Labium (Mask)	
Width of mentum (measured from ventral surface)	8
Length of mentum	9
Number of lateral setae	10
Number of mental setae	11
Labial palps	
Distance from lateral point of articulation with mentum to base of movable hook	12
Distance from articulation of palp with mentum to internal angle of palp	13
Distance from articulation of palp with mentum to base of mentum	14
Color markings on palpi and mentum	15
f. Formula for mandibles	16
3. Thorax	
a. Length	17
b. Wing-pads	
Size	
Length of meso- and meta-thoracic wing-pads	18
Number of abdominal segments covered	19

- c. Legs
  - Tarsal joints
    - Number of tarsal joints...................... 20
    - Relative length of tarsal joints................ 21
- 4. Abdomen
  - a. Size
    - Length 22
    - Greatest width (at sixth segment)............ 23
  - b. Color markings 24
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    - Length of lateral spine, eighth segment........ 26
    - Length (middorsal) of eighth segment......... 27
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    - Length (middorsal) of ninth segment......... 29
    - Length of lateral spines compared with basal breadth 30
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    - Number of appendages...................... 35
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    - Length of anal appendages................... 37

First Instar

1. Length of exuviae, 1.080–1.140 mm.
2. Length of head, 0.240–0.280 mm.
3. Width of head, 0.340–0.355 mm.
4. Width of eye, 0.078–0.085 mm. Eyes about three-sevenths width of head.
5. Horns present. Length, 0.034–0.046 mm.
6. Antennae three-jointed.
7. Length of antennal joints: First 0.018–0.030 mm., second 0.058–0.060 mm., third 0.180–0.202 mm.
8. Width of mentum, 0.320–0.360 mm.

9. Length of mentum, 0.160–0.214 mm.
10. One lateral seta.
11. No mental setae.
12. Distance from point of articulation of palp and mentum to movable hook, 0.156–0.180 mm.
13. Distance from articulation of palp and mentum to internal angle of palp, 0.149–0.180 mm.
14. Distance from articulation to base of mentum, 0.214–0.220 mm.
15. Very light brown patch at tip of mentum.
16. Mandibular formula: $\frac{\text{R-1,2,3,4,0,b}}{\text{L-1,2,3,4,0,b}}$
17. Length of thorax, 0.220–0.280 mm.
18 and 19. No wing-pads present.
20 and 21. One tarsal joint.
22. Length of abdomen, 0.580–0.684 mm.
23. Width of abdomen, 0.282–0.342 mm.
24. No color markings on abdomen.
25, 26, 28 and 30. No lateral abdominal spines.
27. Length of segment eight, 0.040–0.080 mm.
29. Length of ninth abdominal segment, 0.054–0.100 mm.
31. No lateral keels. Setae scattered over body. Setae in a row especially at end of segment nine.
32. No dorsal hooks.
33. Length of segment nine, 0.052–0.120 mm.
34. Length of segment ten and appendages. 0.156–0.222 mm.
35. Appendix dorsalis and cerci present.
36. No color markings on anal appendages.
37. Length of anal appendages: Superior, 0.120–0.140 mm.; Inferior, 0.160–0.180 mm.

Second Instar

1. Total length of exuviae, 1.369–1.463 mm.
2. Length of head, 0.299–0.308 mm.
3. Width of head, 0.424–0.492 mm.
4. Width of eye, 0.089–0.107 mm. Eyes from two-fifths to one-half width of the head.
5. Length of horns, 0.040–0.046 mm.
6. Three antennal joints.

7. Length of antennal joints: First, 0.046–0.060 mm.; second, 0.060–0.080 mm.; third, 0.244–0.280 mm.
8. Width of mentum, 0.460–0.500 mm.
9. Length of mentum, 0.256–0.300 mm.
10. One lateral seta.
11. One mental seta.
12. Distance from point of articulation of palp with mentum to movable hook, 0.240–0.283 mm.
13. Distance from point of articulation of palp and mentum to internal angle of palp, 0.184–0.202 mm.
14. Distance from articulation to base of mentum, 0.260–0.310 mm.
15. Light brown patch at tip of mentum and one near internal angle of palp.
16. Mandibular formula: $\frac{\text{R-1,2,3,4,0,b}}{\text{L-1,2,3,4,0,b}}$
17. Length of thorax, 0.380–0.428 mm.

18 and 19. No wing-pads present.

20 and 21. One tarsal joint.

22. Length of abdomen, 0.727–0.728 mm.
23. Width of abdomen, 0.420–0.428 mm.
24. No color markings on the abdomen.

25, 26, 28 and 30. No lateral abdominal spines.

27. Length of segment eight, 0.080–0.100 mm.
29. Length of ninth abdominal segment, 0.090–0.120 mm.
31. No lateral keels. Hairlike setae near posterior end of segments 6, 7, 8 and 9. Cerci with setae.
32. No dorsal hooks.
33. Length of segment nine, 0.144–0.156 mm.
34. Length of segment ten and anal appendages, 0.160–0.174 mm.
35. Appendix dorsalis and cerci present.
36. No color markings on the anal appendages.
37. Length of anal appendages: Superior, 0.117–0.142 mm.; Inferior, 0.156–0.171 mm.

Third Instar

1. Total length of exuviae, 1.485–1.875 mm.
2. Length of head, 0.385–0.428 mm.
3. Width of head, 0.531–0.620 mm.

4. Width of eye, 0.103–0.140 mm. Eyes from two-fifths to one-half the width of the head.
5. Length of horns, 0.085–0.091 mm.
6. Antennae four-jointed.
7. Length of antennal joints: First, 0.045–0.060 mm.; second, 0.070–0.080 mm.; third, 0.100–0.120 mm.; fourth, 0.206–0.242 mm.
8. Width of mentum, 0.513–0.556 mm.
9. Length of mentum, 0.410–0.485 mm.
10. Two lateral setae.
11. Three mental setae.
12. Distance from point of articulation of palp with mentum to movable hook, 0.265–0.291 mm.
13. Distance from articulation of palp and mentum to internal angle of palps, 0.226–0.257 mm.
14. Distance from articulation to base of mentum, 0.385–0.427 mm.
15. Light brown patch at tip of mentum and near internal angle of palp. Smaller spots on palpi and on mentum.
16. Mandibular formula: $\frac{\text{R-1,2,3,4,0,b}}{\text{L-1,2,3,4,0,b}}$
17. Length of thorax, 0.321–0.470 mm.
18 and 19. No wing-pads present.
20 and 21. One tarsal joint.
22. Length of abdomen, 0.898–0.984 mm.
23. Width of abdomen, 0.485–0.514 mm.
24. No color markings on the abdomen.
25, 26, 28 and 30. No lateral abdominal spines.
27. Length of segment eight, 0.120–0.136 mm.
29. Length of ninth abdominal segment, 0.100–0.150 mm.
31. No lateral keels. Hairlike setae in rows on 6, 7, 8 and 9 and a few on the cerci.
32. No dorsal hooks.
33. Length of segment nine, 0.140–0.152 mm.
34. Length of segment ten and anal appendages, 0.171–0.175 mm.
35. Appendix dorsalis and cerci present.
36. No color markings on anal appendages.
37. Length of anal appendages: Superior, 0.145–0.150 mm.; Inferior, 0.136–0.160 mm.

Fourth Instar

1. Total length of exuviae, 1.926–2.225 mm.

2. Length of head, 0.385–0.496 mm.

3. Width of head, 0.727–0.787 mm.

4. Width of eyes, 0.158–0.188 mm. Eyes nearly one-half the width of the head.

5. Length of horns, 0.080–0.132 mm.

6. Antennae four-jointed.

7. Length of antennal joints: First, 0.040–0.070 mm.; second, 0.080–0.086 mm.; third, 0.152–0.164 mm.; fourth, 0.256–0.294 mm.

8. Width of mentum, 0.624–0.642 mm.

9. Length of mentum, 0.510–0.556 mm.

10. Five lateral setae.

11. Four mental setae.

12. Distance from point of articulation of palp with mentum to movable hook, 0.342–0.355 mm.

13. Distance from articulation of palp and mentum to internal angle of palps, 0.280–0.308 mm.

14. Distance from articulation to base of mentum, 0.480–0.513 mm.

15. Light reddish brown patch at tip of mentum and on either palp at point of articulation with mentum and near internal angle.

16. Mandibular formula: $\frac{\text{R–1,2,3,4,0,a,b}}{\text{L–1,2,3,4,0,b}}$

17. Length of thorax, 0.428–0.556 mm.

18 and 19. No wing-pads present.

20. Two tarsal joints.

21. Distal tarsal joint exclusive of the claws more than six times as long as the proximal measured on the upper surface.

22. Length of abdomen, 1.083–1.968 mm.

23. Width of abdomen, 0.620–0.693 mm.

24. No color markings on abdomen.

25, 26, 28 and 30. No lateral abdominal spines.

27. Length of segment eight, 0.138–0.142 mm.

29. Length of ninth abdominal segment, 0.132–0.143 mm.

31. No lateral keels. Few hairlike setae in rows near posterior end of segments 6, 7, 8 and 9.

32. No dorsal hooks.
33. Length of segment nine, 0.168–0.214 mm.
34. Length of segment ten and anal appendages, 0.160–0.205 mm.
35. Appendix dorsalis and cerci present.
36. No color markings on anal appendages.
37. Length of anal appendages: Superior, 0.156–0.160 mm.; Inferior, 0.167–0.185 mm.

Fifth Instar

1. Total length of exuviae, 2.474–2.679 mm.
2. Length of head, 0.556–0.599 mm.
3. Width of head, 0.924–1.052 mm.
4. Width of eye, 0.260–0.299 mm. Eyes little more than one-half the width of the head.
5. Length of horns, 0.080–0.128 mm.
6. Antennae five- or six-jointed.
7. Length of antennal joints: First, 0.060–0.080 mm.; second, 0.090–0.100 mm.; third, 0.124-0.171 mm.; fourth, 0.098–0.128 mm.; fifth, 0.149–0.160 mm.; sixth, 0.160–0.171 mm.
8. Width of mentum, 0.644–0.774 mm.
9. Length of mentum, 0.559–0.783 mm.
10. Five lateral setae.
11. Five mental setae.
12. Distance from point of articulation of palp with mentum to movable hook, 0.419–0.470 mm.
13. Distance from articulation of palp and mentum to internal angle of palp, 0.299–0.364 mm.
14. Distance from articulation to base of mentum, 0.513–0.778 mm.
15. Light brown patch at tip of mentum and on either palp at point of articulation with mentum and near internal angle.
16. Mandibular formula: $\frac{\text{R–1,2,3,4,y,a,b,d}}{\text{L–1,2,3,4,0,a,b}}$
17. Length of thorax, 0.513–0.685 mm.

18 and 19. No wing-pads present, but location of wings determinable by markings.

20. Two tarsal joints.
21. Distal tarsal joint about five times as long as the proximal.
22. Length of abdomen, 1.395–1.498 mm.

23. Width of abdomen, 0.749–0.868 mm.
24. No color markings on the abdomen.
25. No color markings on the lateral spine.
26. No lateral spine on segment eight.
27. Length of eighth abdominal segment, 0.149–0.202 mm.
28. Length of lateral spine of segment nine, 0.013–0.020 mm.
29. Length of ninth abdominal segment, 0.145–0.184 mm.
30. Length and basal breadth of ninth abdominal spine about the same.
31. No lateral keels. Row of few hairlike setae near end of segments 6, 7, 8 and 9.
32. Dorsal hooks very small on segment six, little larger on segments seven and eight—visible under low magnification of compound microscope.
33. Length of segment nine, 0.197–0.243 mm.
34. Length of segment ten and anal appendages, 0.209–0.299 mm.
35. Appendix dorsalis and cerci present.
36. No color markings on anal appendages.
37. Length of anal appendages: Superior, 0.160–0.171 mm.; Inferior, 0.179–0.214 mm.

Sixth Instar

1. Total length of exuviae, 3.347–3.657 mm.
2. Length of head, 0.646–0.724 mm.
3. Width of head, 1.211–1.304 mm.
4. Width of eye, 0.299–0.372 mm. Eyes about one-half the width of the head.
5. Length of horns, 0.096–0.120 mm.
6. Antennae six-jointed.
7. Length of antennal joints: First, 0.051–0.072 mm.; second, 0.094-0.120 mm.; third, 0.128–0.171 mm.; fourth, 0.128–0.141 mm.; fifth, 0.179–0.201 mm.; sixth, 0.162–0.214 mm.
8. Width of mentum, 0.911–0.941 mm.
9. Length of mentum, 0.856–0.931 mm.
10. Six lateral setae.
11. Five mental setae.
12. Distance from point of articulation of palp with mentum to movable hook, 0.526–0.603 mm.
13. Distance from articulation of palp and mentum to internal angle of palp, 0.450–0.500 mm.

14. Distance from articulation to base of mentum, 0.770–1.02 mm.
15. Light brown patches at tip of mentum, near internal angle of palp and at point of articulation with mentum. Small spots of light brown near base of mentum.
16. Mandibular formula: $\frac{R\text{–}1,2,3,4,y,a,b,d}{L\text{–}1,2,3,4,y,a,b}$
17. Length of thorax, 0.856–0.992 mm.
18. Meso- and meta-thoracic wing-pads present as very small protuberances not over 0.090 mm. in length.
19. The meta-thoracic wing-pad does not reach to the abdomen.
20. Two tarsal joints.
21. Distal tarsal joint about five times the proximal in length on the upper surface.
22. Length of abdomen, 1.823–1.947 mm.
23. Width of abdomen, 1.189–1.284 mm.
24. No color markings on the abdomen.
25. No color markings on the lateral spines.
26. Length of lateral spine of segment eight, 0.021–0.034 mm.
27. Length of eighth abdominal segment, 0.205–0.282 mm.
28. Length of lateral spine segment nine, 0.040–0.051 mm.
29. Length of ninth abdominal segment, 0.201–0.218 mm.
30. Length of lateral spines slightly greater than basal breadth.
31. No lateral keels. Row of scattered setae on segments 6, 7 and 8. Row of shorter spine-like setae on segment nine.
32. Dorsal hooks on segments 5, 6, 7 and 8. Only slight protrusions on segments 5 and 6.
33. Length of segment nine, 0.308–0.355 mm.
34. Length of segment ten and anal appendages, 0.226–0.303 mm.
35. Appendix dorsalis, cerci and minute cercoids.
36. No color markings on anal appendages.
37. Length of anal appendages: Superior, 0.171–0.201 mm.; Inferior, 0.222–0.248 mm.; Lateral, 0.017–0.027 mm.

Seventh Instar

1. Total length of exuviae, 4.582–4.665 mm.
2. Length of head, 0.830–0.984 mm.
3. Width of head, 1.455–1.712 mm.
4. Width of eye, 0.406–0.504 mm. Eyes little more than half the width of the head.

5. Length of horns, 0.064–0.115 mm.
6. Antennae six- or seven-jointed.
7. Length of antennal joints: First, 0.085–0.094 mm.; second, 0.095–0.145 mm.; third, 0.154–0.252 mm.; fourth, 0.128–0.184 mm.; fifth, 0.162–0.239 mm.; sixth, 0.196–0.226 mm.; seventh, 0.222 mm.
8. Width of mentum, 1.104–1.241 mm.
9. Length of mentum, 1.155–1.326 mm.
10. Seven lateral setae.
11. Seven mental setae.
12. Distance from point of articulation of palp with mentum to movable hook, 0.702–0.813 mm.
13. Distance from articulation of palp and mentum to internal angle of palp, 0.470–0.610 mm.
14. Distance from articulation to base of mentum, 1.027–1.198 mm.
15. Patches of brown at tip of mentum, at internal angle of palps and on palps at point of articulation with mentum. Smaller brown spots on palps and mentum.
16. Mandibular formula: $\frac{\text{R–1,2,3,4,y,a,b,d.}}{\text{L–1,2,3,4,y,a,b}}$ Denticle on left mandible visible only under the high power of the compound microscope, as in previous instar.
17. Length of thorax, 1.070–1.241 mm.
18. Length of meso-thoracic wing-pad, 0.171–0.256 mm. Length of meta-thoracic wing-pad, 0.205–0.282 mm.
19. Wing-pads do not extend to the first abdominal tergite.
20. Three tarsal joints.
21. Distal tarsal joint as long as other two, middle joint double the proximal in length on upper surface.
22. Length of abdomen, 2.525–2.653 mm.
23. Width of the abdomen, 1.369–1.797 mm.
24. Little very light brown on dorsal surface of segments eight and nine.
25. No color markings on lateral spines.
26. Length of lateral spine of segment eight, 0.042–0.056 mm.
27. Length of eighth abdominal segment, 0.299–0.342 mm.
28. Length of lateral spine of segment nine, 0.086–0.115 mm.
29. Length of ninth abdominal segment, 0.214–0.299 mm.
30. Length of lateral spines double their basal breadth.

31. Slight lateral keels on segment seven. Row of setae somewhat irregular and spine-like, near posterior end of segments eight and nine. Spines also present along the lateral margins of segments eight and nine. Larger scattered spines on segments six and seven.
32. Dorsal hooks on segments 4 to 8 inclusive. On segment four only a marking, on segment five more distinct.
33. Length of segment nine, 0.389–0.511 mm.
34. Length of segment ten and anal appendages, 0.342–0.389 mm.
35. Appendix dorsalis, cerci and cercoids.
36. No color markings on anal appendages.
37. Length of anal appendages: Superior, 0.222–0.235 mm.; Inferior, 0.256–0.308 mm.; Lateral, 0.042–0.059 mm.

Eighth Instar

1. Total length of exuviae, 5.864–6.120 mm.
2. Length of head, 1.072–1.156 mm.
3. Width of head, 2.024–2.182 mm.
4. Width of eye, 0.557–0.642 mm. Eyes about one-half the width of the head.
5. Length of horns, 0.029–0.085 mm. Larva number eleven had no horns but the setae were still visible.
6. Antennae seven-jointed.
7. Length of antennal joints: First, 0.102–0.115 mm.; second, 0.158–0.168 mm.; third, 0.158–0.191 mm.; fourth, 0.136–0.196 mm.; fifth, 0.214–0.231 mm.; sixth, 0.243–0.281 mm.; seventh, 0.226–0.299 mm.
8. Width of mentum, 1.408–1.523 mm.
9. Length of mentum, 1.592–1.672 mm.
10. Eight lateral setae.
11. Eight mental setae.
12. Distance from point of articulation of palp with mentum to movable hook, 0.770–0.942 mm.
13. Distance from articulation of palp and mentum to internal angle of palp, 0.462–0.715 mm.
14. Distance from articulation to base of mentum, 1.254–1.412 mm.
15. Light brown patch at tip of mentum, one on each palp at the point of articulation with mentum, and one near internal angle of palps.

16. Mandibular formula: $\frac{\text{R–1,2,3,4,y,a,b,d}}{\text{L–1,2,3,4,y,a,b}}$
17. Length of thorax, 1.412–1.498 mm.
18. Length of meso-thoracic wing-pads, 0.470–0.606 mm.
    Length of meta-thoracic wing-pads, 0.475–0.526 mm.
19. Meta-thoracic wing-pad reaches to the third abdominal segment.
20. Three tarsal joints.
21. Distal joint longer than other two, middle joint double the proximal in length.
22. Length of abdomen, 3.296–3.552 mm.
23. Width of abdomen, 2.182–2.234 mm.
24. Large brown patches on abdominal tergites 4-9 inclusive, but not on middorsal line.
25. No color markings on lateral spines.
26. Length of lateral spines of segment eight, 0.085–0.132 mm.
27. Length of eighth abdominal segment, 0.385–0.445 mm.
28. Length of lateral spine of segment nine, 0.145–0.209 mm.
29. Length of ninth abdominal segment, 0.321–0.393 mm.
30. Length of eighth and ninth lateral spines little more than double their basal breadth.
31. Lateral keels on segments 5, 6 and 7. Short spine-like setae in rows near posterior end of segments 7, 8 and 9 and along their lateral margins.
32. Dorsal hooks on segments 4 to 8 inclusive.
33. Length of segment nine, 0.462–0.526 mm.
34. Length of segment ten and anal appendages, 0.496–0.556 mm.
35. Appendix dorsalis, cerci and cercoids.
36. No color markings on anal appendages.
37. Length of anal appendages: Superior, 0.256–0.346 mm.; Inferior, 0.350–0.415 mm.; Lateral, 0.098–0.179 mm.

Ninth Instar

1. Total length of exuviae, 7.760–8.401 mm.
2. Length of head, 1.312–1.455 mm.
3. Width of head, 2.589–3.458 mm.
4. Width of eye, 0.620–0.663 mm. Eyes about one-half the width of the head.
5. Horns just visible on larva number three, but are not present on the other individuals.

6. Antennae seven-jointed.
7. Length of antennal joints: First, 0.107–0.158 mm.; second, 0.141–0.184 mm.; third, 0.205–0.261 mm.; fourth, 0.191–0.205 mm.; fifth, 0.214–0.262 mm.; sixth, 0.265–0.342 mm.; seventh, 0.299–0.303 mm.
8. Width of mentum, 1.690–1.938 mm.
9. Length of mentum, 1.926–2.195 mm.
10. Nine lateral setae.
11. Nine mental setae.
12. Distance from point of articulation of palp with mentum to movable hook, 0.985–1.121 mm.
13. Distance from articulation of palp and mentum to internal angle of palp, 0.813–0.928 mm.
14. Distance from articulation to base of mentum, 1.712-2.054 mm.
15. Brown patch at apex of mentum, at internal angle of each palp, and at the point of articulation of palp with mentum. Smaller brown spots on palps and mentum.
16. Mandibular formula: $\frac{\text{R-1,2,3,4,y,a,b,d}}{\text{L-1,2,3,4,y,a,b}}$
17. Length of thorax, 1.520–2.247 mm.
18. Length of meso-thoracic wing-pad, 0.941–1.198 mm. Length of meta-thoracic wing-pad, 0.856–1.035 mm.
19. Meta-thoracic wing-pads extend over three and one-third abdominal segments.
20. Three tarsal joints.
21. Distal tarsal joint nearly double the length of the other two, middle joint about double the proximal.
22. Length of the abdomen, 4.280–4.836 mm.
23. Width of abdomen, 2.653–3.107 mm.
24. Brown markings on abdominal tergites 4-9 inclusive—not on middorsal line.
25. No color markings on lateral spines.
26. Length of lateral spine of segment eight, 0.171–0.256 mm.
27. Length of eighth abdominal segment, 0.479–0.543 mm.
28. Length of lateral spine of segment nine, 0.299–0.385 mm.
29. Length of ninth abdominal segment, 0.419–0.449 mm.
30. Length of lateral spines from 2.2 to 2.7 times basal breadth.
31. Lateral keels on segments four to seven inclusive. Row of short spine-like setae near posterior end of segments 7, 8 and 9, and on lateral margins of each and on lateral spines.

32. Dorsal hooks on segments 4 to 8 inclusive.
33. Length of segment nine, 0.648–0.749 mm.
34. Length of segment ten and anal appendages, 0.663–0.898 mm.
35. Appendix dorsalis, cerci and cercoids.
36. No color markings on the anal appendages.
37. Length of anal appendages: Superior, 0.381–0.471 mm.; Inferior, 0.479–0.541 mm.; Lateral, 0.167–0.214 mm.

Tenth Instar

1. Total length of exuviae, 10.400–11.360 mm.
2. Length of head, 1.760–2.080 mm.
3. Width of head, 3.124–3.680 mm.
4. Width of eye, 0.856–1.231 mm. Eyes from one-half to three-fifths the width of the head.
5. No horns present.
6. Antennae seven-jointed.
7. Length of antennal joints: First, 0.153–0.171 mm.; second, 0.179–0.202 mm.; third, 0.282–0.287 mm.; fourth, 0.226–0.256 mm.; fifth, 0.235–0.299 mm.; sixth, 0.299–0.342 mm.; seventh, 0.342–0.342 mm.
8. Width of mentum, 2.097–2.354 mm.
9. Length of mentum, 2.525–2.696 mm.
10. Nine lateral setae.
11. Ten or eleven mental setae.
12. Distance from point of articulation of palp with mentum to movable hook, 1.241–1.583 mm.
13. Distance from articulation of palp and mentum to internal angle of palp, 0.962–1.232 mm.
14. Distance from articulation to base of mentum, 2.140–2.811 mm.
15. Brown patch at tip of mentum, near internal angle of palps, and at point of articulation of palp with mentum. Smaller brown spots on mentum and palps.
16. Mandibular formula: $\frac{R-1,2,3,4,y,a,b,d}{L-1,2,3,4,y,a,b}$
17. Length of thorax, 2.400–3.440 mm.
18. Length of meso-thoracic wing-pad, 1.977–2.182 mm. Length of meta-thoracic wing-pad, 1.926–2.118 mm.
19. Meta-thoracic wing-pad reaches to the fourth abdominal segment or to the beginning of the fifth segment.

20. Three tarsal joints.
21. Distal tarsal joint as long as other two, middle joint about one-third longer than the proximal joint.
22. Length of abdomen, 5.760–6.400 mm.
23. Width of abdomen, 3.424–3.466 mm.
24. Large brown patches present on either side of middorsal line from segment four to end of the abdomen. Living larvae appeared more green than brown.
25. Lateral spines are brown-tipped.
26. Length of lateral spine of segment eight, 0.297–0.343 mm.
27. Length of eighth abdominal segment, 0.606–0.701 mm.
28. Length of lateral spine of segment nine, 0.428–0.556 mm.
29. Length of ninth abdominal segment, 0.526–0.590 mm.
30. Length of lateral spines about three times basal breadth.
31. Lateral keels on segments 4, 5, 6 and 7. Row of spine-like setae at posterior end of segments 7, 8 and 9, and on their lateral margins and on lateral spines.
32. Dorsal hooks on segments 4 to 8 inclusive.
33. Length of segment nine, 0.768–0.941 mm.
34. Length of segment ten and anal appendages, 0.896–1.070 mm.
35. Appendix dorsalis, cerci and cercoids.
36. Appendix dorsalis and cerci slightly brown tipped.
37. Length of anal appendages: Superior, 0.599–0.652 mm.; Inferior, 0.748–0.813 mm.; Lateral, 0.294–0.376 mm.

Eleventh Instar

1. Total length of exuviae, 12.480–14.240 mm.
2. Length of head, 2.080–2.400 mm.
3. Width of head, 4.336–5.512 mm.
4. Width of eye, 0.912–1.082 mm. Eyes about two-fifths th width of head.
5. No horns present.
6. Antennae seven-jointed.
7. Length of antennal joints: First, 0.171–0.214 mm.; second 0.214–0.248 mm.; third, 0.415–0.479 mm.; fourth, 0.291-0.342 mm.; fifth, 0.321–0.368 mm.; sixth, 0.372–0.436 mm. seventh, 0.342–0.398 mm.
8. Width of mentum, 2.696–3.081 mm.
9. Length of mentum, 2.589–3.210 mm.
10. Nine lateral setae.

11. Eleven mental setae.
12. Distance from articulation of palp with mentum to movable hook, 1.840–1.926 mm.
13. Distance from articulation of palp and mentum to internal angle of palp, 1.027–1.339 mm.
14. Distance from articulation to base of mentum, 2.654–2.867 mm.
15. Brown patch at tip of mentum, one on palp at internal angle and one near articulation with mentum. Many smaller brown spots on mentum and palpi.
16. Mandibular formula: $\frac{\text{R-1,2,3,4,y,a,b,d}}{\text{L-1,2,3,4,y,a,b}}$
17. Length of thorax, 3.360–3.840 mm.
18. Length of meso-thoracic wing-pad, 3.595–4.160 mm. Length of meta-thoracic wing-pad, 3.727–4.023 mm.
19. Meta-thoracic wing-pad in most individuals reaches to about the middle of sixth abdominal segment.
20. Three tarsal joints.
21. Distal tarsal joint equal in length to other two, middle joint double proximal.
22. Length of abdomen, 7.040–8.530 mm.
23. Width of abdomen, 3.432–4.560 mm.
24. Abdominal segments from fourth to end are brown in color on dorsal surface.
25. Lateral spines brown tipped with reddish brown.
26. Length of lateral spine of segment eight, 0.415–0.500 mm.
27. Length of eighth abdominal segment, 0.684–0.856 mm.
28. Length of lateral spine of segment nine, 0.727–0.845 mm.
29. Length of ninth abdominal segment, 0.621–0.757 mm.
30. Length of lateral spines about three times their basal breadth.
31. Lateral keels on segments 4-7 inclusive. Rows of short spine-like setae near end of segments 6, 7, 8 and 9 dorsally and 7, 8 and 9 ventrally. Also setae on lateral margins of same segments and on lateral spines.
32. Dorsal hooks on segments 4 to 8 inclusive.
33. Length of segment nine, 0.771–1.112 mm.
34. Length of segment ten and anal appendages, 1.027–1.356 mm.
35. Appendix dorsalis, cerci and cercoids.
36. Anal appendages tipped with reddish brown.
37. Length of anal appendages: Superior, 0.821–0.976 mm.; Inferior, 1.134–1.241 mm.; Lateral, 0.547–0.642 mm.

Key to Larval Instars

a.—Wing-pads and lateral anal appendages absent.
b.—Three antennal joints.
c.—One lateral, no mental setae..............First instar
cc.—One lateral, one mental seta...........Second instar
bb.—Four or more antennal joints.
c.—Two lateral and three mental setae.......Third instar
cc.—Five or sometimes four lateral and four mental setae ....Fourth instar
ccc.—Five lateral and five mental setae.......Fifth instar
aa.—Wing-pads distinguishable, lateral anal appendages present.
b.—Tarsal joints two..........................Sixth instar
bb.—Tarsal joints three
c.—Seven lateral and six or seven mental setae. Seventh instar
cc.—Eight lateral and eight mental setae....Eighth instar
ccc.—Nine lateral setae.
d.—Nine or ten mental setae, total length less than 9 mm., wing-pads less than 5 mm. long...Ninth instar
dd.—Ten or eleven mental setae, total length between 9 and 11 mm., wing-pads between 1.5 and 2.5 mm. long.........................Tenth instar
ddd.—Eleven mental setae, total length more than 12 mm., wing-pads more than 3.5 mm. long Eleventh instar

SUMMARY

The following larval changes, numbered to correspond with the outline of characters, were noted.

5. The horns on the vertex seem to become longer during the first two instars, but disappear after the eighth or ninth instars.

6. The antennae are three-jointed in the first two instars, three- or four-jointed in the third, four-jointed in the fourth, five- or six-jointed in the fifth, six-jointed in the sixth, six- or seven-jointed in the seventh, seven-jointed in the following instars.

8 and 9. In early instars the mentum is much wider than long, but in later instars the width and length are nearly the same.

10. One lateral seta in the first and second instars, two setae in the third, four in the fourth, five in the fifth, six in the sixth, seven in seventh, eight in eighth, and nine in ninth, tenth and eleventh instars.

11. In the first instar there are no mental setae, in the second instar one seta, in the third three setae, in the fourth four, in fifth and sixth five, in the seventh six or seven, in eighth eight, in ninth nine or ten, in tenth ten or eleven, and in eleventh eleven.

12, 13 and 14. In all instars the length of the labial palp from the lateral point of articulation of palp with mentum to base of the movable hook is longer than the distance from the articulation to the internal angle of the palp, but shorter than the distance from the articulation to the base of the mentum.

15. In the first instar there is one light brown patch at the apex of the mentum, but in later instars there are large brown patches at the point of articulation of the palp with mentum and near the internal angle of each palp. There are also smaller brown spots on palps and on mentum in later instars.

16. In early instars no denticles are present on the mandibles, but in later instars a denticle is present on each. There is only one proximal tooth on each mandible in early instars, but later there are three on the right mandible and two on the left.

18 and 19. Location of wing-pads discernible in the fifth instar. These increase in length until they cover five or six abdominal segments in the eleventh instar.

20. In the first three instars there is only one tarsal joint; in the fourth, fifth and sixth instars there are only two tarsal joints, while in later instars there are three.

24. In early instars the abdomen bears no color markings, while later it is marked with brown on the dorsal surface.

25-30. The lateral spine of segment nine appears first in the fifth instar—both eighth and ninth lateral spines are present from sixth to final instar. The lateral spines are brown tipped in last two instars.

31. Lateral keels present on segment seven in seventh instar, on segments 5, 6 and 7 in eighth instar and from 4 to 7 in the following stars.

32. Dorsal hooks appear on segments 6, 7 and 8 in fifth instar, and on 5 to 8 in sixth instar, on segments 4 to 8 inclusive in the following instars.

35. Superior and inferior appendages are present in the first instar. The laterals appear first in the sixth instar.

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ADDITIONAL DESCRIPTIONS, SYNONYMY AND RECORDS OF NORTH AMERICA BUMBLEBEES

(HYMENOPTERA: BREMIDAE)

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A. Distributional Records

In accordance with a policy established some years ago, the writer from time to time has published new and important distributional records of bumblebees obtained by the study and identification of specimens received from various institutions and individuals. The number of such new records for states, or comparable political areas, is markedly diminishing and the following records will be the last published by the writer until the appearance of his revisional paper when all records will be summarized for species and varieties.

For the loan of material upon which the following records are based I am indebted to the following: Prof. T. D. A. Cockerell, University of Colorado, Boulder, Colorado; Mr. H. A. Scullen, Oregon State Agricultural College, Corvallis, Oregon; Dr. V. M. Tanner, Brigham Young University, Provo, Utah; Prof. C. H. Kennedy, Ohio State University, Columbus, Ohio; Dr. J. McDunnough, Department of Agriculture, Ottawa, Canada; Mr. F. M. Gaige, Museum of Zoology, Ann Arbor, Michigan; and Prof. H. C. Severin, Brookings, South Dakota.

1. **Bremus separatus** var. **mormonorum** (Franklin)

Paris, Idaho, four workers, September 5, 1925 (C. L. Hayward).

2. **Bremus rufocinctus** var. **iridis** (Cockerell and Porter)

Queens, workers and males from the following localities in Michigan: Skeels, Douglas Lake, Interlochen, White Fish Point, Port Austin and Mackinac Co. Two queens, June 13, 1924 (S.

Moore) and July 13, 1926 (Thompson); fourteen workers, June 28, 1926, July 17, 1925, August 20, 1926 (C. F. Byers) and August 21, 1924 (F. M. Gaige); six males, August 24, 1924 (F. M. Gaige) and September 1, 1925 (Fargo).

3. **Bremus rufocinctus** var. **prunellae** (Cockerell and Porter)

Miner's Peak, Iron Co., Utah, one worker, July 13, 1919; Fish Lake, Oregon, one queen, 7000 ft. elevation, July 11, 1927 (H. A. Scullen); Port Austin, Michigan, four queens, one worker and one male, August 24-27, 1924 (F. M. Gaige); Alpena, Michigan, one queen, September 13, 1925 (C. L. Hubbs).

4. **Bremus rufocinctus** var. **albertensis** (Cockerell)

La Kota, Bear Lake, Utah, two queens, June, 1926 (V. M. Tanner); Lake, Sheep Creek, Utah, elevation 8000 ft., one queen, June, 1926 (V. M. Tanner); Aspen Grove, Timpanogas Peak, Utah, two queens (V. M. Tanner); Wellsville Canyon, Utah, one queen, June, 1926 (V. M. Tanner); Paris, Idaho, two workers, August, 1926 (C. L. Hayward); Custer, South Dakota, one male, Sept. 11, 1927 (H. C. Severin); Point Pelee Island, Ontario, one worker, August 23, 1926 (C. H. Kennedy).

5. **Bremus fervidus** var. **dorsalis** (Cresson)

Queens and workers from the following localities in Utah: Provo, Logan Canyon, La Sal, Moab, and Bryce Canyon. Five queens, April and June, 1926 (V. M. Tanner, C. L. Haywood and A. Call); six workers (V. M. Tanner, I. Rasmussen and J. Kartchner).

6. **Bremus californicus** (F. Smith)

Laramie, Wyoming, nine workers and four males, 8000 ft. elevation, September 12, 1927 (H. A. Scullen).

7. **Bremus californicus** var. **dubius** (Cresson)

Vernon, British Columbia, two males, August 10, 1926.

8. **Bremus americanorum** (Fabricius)

La Sal, Utah, one worker (J. Kartchner); Moab, Utah, five workers (V. M. Tanner, I. Rasmussen, J. Kartchner); Newport, Lincoln Co., Oregon, one male, August 1-12, 1926 (C. L. Hubbs).

9. **Bremus occidentalis** (Greene)

Custer, South Dakota, one male, September 11, 1927 (H. C. Severin).

10. **Bremus occidentalis** var. **proximus** (Cresson)

Hillsborough, California, one male and three workers, July 6, 1926 (G. Ray).

11. **Bremus affinis** var. **novae-angliae** (Bequaert)

Washtenaw Co., Ann Arbor, Michigan, two males, September 21, 1924 (F. M. Gaige).

12. **Bremus edwardsii** (Cresson)

Zion National Park, Utah, one worker and two males (A. M. Woodbury).

13. **Bremus bifarius** (Cresson)

Cormorant Lake, Manitoba, July 1, 1927 (J. Russell).

14. **Bremus bifarius** var. **vancouverensis** (Cresson)

Meacham, Oregon, one queen, 3680 ft. elevation, May 8, 1927 (H. A. Scullen); Fish Lake, Steen Mts., Oregon, two queens, July 1-10, 1927 (H. A. Scullen); White Horse, Yukon Territory, five males and one worker, August, 1926 (T. D. A. Cockerell); Carcross, Yukon Territory, three males, August, 1926 (T. D. A. Cockerell).

15. **Bremus bifarius** var. **nearcticus** (Handlirsch)

Moscow, Idaho, one worker (J. Sudweeks); Paris, Idaho, one worker, September 5, 1926 (C. L. Hayward); La Kota, Bear Lake, Utah, one worker, June, 1926 (V. M. Tanner); and Burnt Fork, Wyoming, one worker, June, 1926 (V. M. Tanner).

16. **Bremus sylvicola** (Kirby)

Wakeham Bay, Hudson Straits, Canada, two queens, one worker and four males, August, 1927 (F. Johansen); Aspen Grove, Timpanogas Peak, Utah, one queen (V. M. Tanner); Glacier Lake, Timpanogas, Utah, eight workers and one male (V. M. Tanner).

17. **Bremus frigidus** var. **couperi** (Cresson)

Cormorant Lake, Manitoba, three workers, July 1, 1927 (J. Russell).

18. **Bremus melanopygus** (Nylander)

Cormorant Lake, Manitoba, one worker, July 1, 1927 (J. Russell); Cedar Mt., Idaho, one male, July 25, 1920 (L. P. Rockwood); Wallace, Idaho, one worker, June 15, 1926 (C. L. Hubbs); Moscow, Idaho, one worker (J. Sudweeks).

19. **Bremus perplexus** (Cresson)

Put-in-Bay, Ohio, one worker and three males, July 1-20, 1922 (C. H. Kennedy); Columbus, Ohio, two males and one worker; Pinnacle Mountain, South Carolina, August 3, 1926 (F. Sherman).

20. **Bremus vagans** (F. Smith)

Moscow, Idaho, one worker (J. Sudweeks).

21. **Bremus flavifrons** (Cresson)

Carcross, Yukon Territory, two workers, August, 1926 (T. D. A. Cockerell); White Horse, Yukon Territory, one worker and one male, August, 1926 (T. D. A. Cockerell).

22. **Bremus flavifrons** var. **vandykei** Frison

Cloud Cap Inn, Cooper's Spur, Mt. Hood, Oregon, five workers, August 19-21, 1927 (H. A. Scullen).

23. **Bremus centralis** var. **monardae** (Cockerell and Porter)

Union, Oregon, two males, June 11, 1926, and August 7, 1918 (M. M. Rheer); Wellsville Canyon, Utah, three queens, June, 1926 (V. M. Tanner).

24. **Psithyrus ashtoni** (Cresson)

Cormorant Lake, Manitoba, three males, July 1, 1927 (J. Russell).

25. **Psithyrus suckleyi** (Greene)

Skagway, Alaska, two males, August, 1926 (T. D. A. Cockerell).

26. **Psithyrus insularis** (F. Smith)

Cedar Mountain, Idaho, three males, July 25, 1920 (L. P. Rockwood); Cormorant Lake, Manitoba, one male, July 1, 1927 (J. Russell).

27. **Psithyrus variabilis** (Cresson)

Lawrence Co., Ohio, one male, August 23, 1926 (C. H. Kennedy); Gainesville, Florida, three males, September 18-November 20, 1923 (T. H. Hubbell); Cuernavaca, Mexico, one queen, September, 1923 (E. G. Smyth).

28. **Psithyrus fernaldae** Franklin

Cormorant Lake, Manitoba, three males, July 1, 1927 (J. Russell).

B. New Descriptions

Bremus centralis var. **fucatus** new variety

Queen.—Structurally identical with the queen of *centralis* (Cresson) as redescribed by Franklin (1913). Differs from typical specimens of *centralis* in having a ferruginous band on the dorsum of the thorax between the bases of the wings instead of a black band. In addition to the ferruginous band on the thorax, which I am making the real differential character for the separation and recognition of this color variety, the specimens from Utah have a varying amount of ferruginous pubescence on the middle dorsal portions of the first and second abdominal segments instead of the customary yellow of typical specimens. In specimens from New Mexico belonging to this color variety, the pubescence on the first and second dorsal abdominal segments is as in typical specimens.

Holotype.—Queen; Springville, Utah, collected by L. Alleman. *Paratypes.*—Three queens, Elk Ridge, Bear Ears, Utah, collected by Call, Rasmussen, or Kartchner; two queens, Jemez Springs, New Mexico, 6400-6800 ft. alt., May 31 and June 16, 1915, collected by John Woodgate; and one queen, Chusca Mts., Cottonwood Pass, New Mexico, 7800 ft. alt., July 3, 1918, collected by A. Wetmore.

Holotype deposited in the collection of the author. One paratype deposited in each of the following collections: The American Entomological Society, Philadelphia, Pennsylvania, United States National Museum, Washington, D. C., and Brigham Young University, Provo, Utah. Remainder of paratypes in the collection of the author.

Bremus centralis var. **stolidus** new variety

Queen.—Structurally indentical with the queen of *centralis* (Cresson) as redescribed by Franklin (1913). Differs from typical specimens in having a slight amount of ferruginous pubescence on the middle dorsal area of the first segment and a conspicuous amount on the second abdominal segment. Differs from *centralis* var. *fucatus* Frison in having a band of black pubescence between the wings.

Holotype.—Queen; Provo, Utah, April, 1926, collected by C. L. Hayward. Deposited in the collection of the author.

Bremus sylvicola var. **sculleni** new variety

Queen.—Structurally identical with the typical *sylvicola* (Kirby) found in northern North America and at high elevations in the western United States. Differs from typical *sylvicola* in having yellow pubescence on the middle areas of the second and third dorsal abdominal segments instead of being entirely ferruginous, and in some specimens with the pubescence of the third dorsal abdominal segment almost entirely yellowish in color.

Holotype.—Queen; Fish Lake, Steens Mt., Oregon, 7000 ft. alt., July 12, 1927, collected by H. A. Scullen. *Paratypes.*—Nine queens, same data as holotype except dates of capture vary from July 8 to July 11, 1927.

Holotype deposited in the collection of the author. One paratype deposited in the collection of The American Entomological Society, Philadelphia, Pennsylvania, one in the United States National Museum, three in the Oregon Agricultural College, Corvallis, Oregon, and the remainder in the collection of the author.

I take pleasure in naming this color variety for its collector, Mr. H. A. Scullen, who has collected and submitted to me for study hundreds of bumblebees from various parts of Oregon.

I am determining as this color variety, but not including in the typic series, one specimen of a queen from Silver Lake, Utah, collected by the late H. Skinner. It differs from the typic specimens of *sylvicola* var. *sculleni* in having the third dorsal abdominal segment entirely ferruginous. It is really a transitional form between var. *sculleni* and the typical *sylvicola* (Kirby).

Bremus caliginosus Frison

1927. *Bremus caliginosus* Frison, Proc. Calif. Acad. Sc., (4), XVI, No. 12 (April 27th), p. 376. ♂.

Queen.—Face and occiput with lemon-yellow hairs; occipital orbits with black hairs. Labrum with tubercle-like areas separated by about one-half the length of one; punctate on mesal and posterior portion; anterior lateral area almost impunctate, smooth and shining. Shelf-like projection about one-third as broad as labrum; the areas adjacent to projection and anterior of tubercle-like areas are mostly impunctate, smooth and shining. Mandible three-toothed, with a slight indication of a fourth tooth on the lower mesal margin, with numerous minute and a few large well scattered punctures; setae on distal portion between carinae dense, short and golden brown in color, a few long hairs of same color on lower proximal portion. Clypeus, shining, with some scattered moderately-sized punctures, particularly on declivous lateral and proximal portions; mesal anterior portion smooth and almost impunctate. Malar space slightly longer than its width at articulation with mandible; slightly over one-half as long as greatest width of and one-fourth length of eye, impunctate, polished. Ocelli situated slightly above the narrowest part of the vertex, just below the supraorbital line; lateral ocelli slightly closer to the inner margin of eyes than to one another; area directly lateral of each ocellus with punctures extending about one-third of the way from inner margin of eye to ocellus, the mesal portion being impunctate and polished. Eyes not swollen and conspicuously bulging from the sides of the head. Flagellum almost twice as long as the scape; third antennal segment almost twice as long as the fifth, the fifth slightly longer than the fourth.

Dorsum of the thorax with anterior portion with lemon-yellow pubescence, remainder with black pubescence. Posterior margin of yellow pubescence on anterior dorsal part of thorax not straight across between the bases of the wings, but extending backward between the parapsidal grooves as far back as the end of the median furrow or the middle of the shining, impunctate disk. Yellow pubescence of thorax not extending below bases of wings, the pleurae being entirely black.

Abdomen with the pubescence on dorsal segments colored as follows: Three basal segments black, fourth segment yellow, fifth and sixth segments black. Venter with black pubescence. Hypopygium with a slight median carina.

Legs black, but with the usual stout ferruginous setae on the tarsi. Corbicular fringes black. Metabasitarsus slightly arcuate on posterior margin. Mesobasitarsus at apical outer angle without a pronounced, sharp, spinelike projection.

Wings very dark brown with a slight violaceous reflection.

Length, 16 mm.; spread of wings, 34 mm.; width of abdomen at second segment, 8 mm.

Allotype.—Queen; Alsea, Oregon, May 6, 1928, collected by H. A. Scullen. Other queens as follows: One, Corvallis, Oregon, April 12, 1925, H. A. Scullen collector; one, Olney, Oregon, June 15, 1925, E. P. Van Duzee collector; one, Muir Woods, Marin Co., California, May 4, 1912, E. C. Van Dyke collector; one queen, Seattle, Washington, May 3.

Allotypic queen deposited in the collection of the author.

Worker.—In coloration and structure, except for smaller size, similar to the queen. Length, 12 mm.; spread of wings, 24 mm.; width of abdomen at second segment, 5 mm.

Morphotype.—Worker; Corvallis, Oregon, August 8, 1924, collected by H. A. Scullen. Other workers as follows: Two, Corvallis, Oregon, September 6, 1924, H. A. Scullen collector; one, Corvallis, Oregon, June 21, 1924, H. A. Scullen collector; four, Carmel, California, June 20, June 24 and July 10, 1921, and July 6, 1925, L. S. Slevin collector; two, Waldport, Oregon, June 5, 1925, E. P. Van Duzee and E. C. Van Dyke collectors. Morphotypic worker deposited in the collection of the author.

This interesting species of western bumblebee, masquerading in the livery of *vosnesenskii* (Rad.), was originally described by the writer from male specimens. At the time it was stated that "I have tried to definitely locate and separate the workers and queens of *vosnesenskii* and *caliginosus,* without satisfying results. At least, I have not been able to point out any tangible characters for their separation by others." A restudy of specimens of *vosnesenskii* and material suspected of being the workers and queens of *caliginosus* has resulted in the recognition of the latter.

As previously supposed, and so stated, the queens and workers of *caliginosus* mimic in color those of *vosnesenskii* (Rad.). Also, as previously supposed but not stated, the queens and workers of *caliginosus* have certain structural characters which prove them to belong to the *sitkensis-flavifrons* complex of the subgenus *Pratobombus.* This was predictable because of characters of the males. In addition to structural characters, the females and workers possess a readily observed color character which holds for the species; namely, the extension of the yellow pubescence on the anterior dorsal part of the thorax as a mesal patch on the disk of the mesonotum as far backward as the end of the median stria. This color character applies, also, to the males as well as the females. It was not mentioned in the original description of the males because of the lack of sufficient information regarding its specific value.

Bremus vagans var. **helenae** new variety

Male.—Structurally identical with the male of *vagans* (F. Sm.). Differs from typical specimens of *vagans* in having yellowish pubescence on the dorsum of some or all of the last three abdominal segments.

Queen.—Structurally identical with the queen of *vagans* (F. Sm.). Differs from typical specimens of *vagans* in having yellowish pubescence on the fifth dorsal abdominal segment.

Holotype.—Male, Hermon, New York, August 18, 1916. *Allotype.*—Queen, Chestnut Hill, Pennsylvania, May 14, 1903. *Paratypes.*—One male Syracuse, New York, August 26, 1918, A. J. Basinger collector; one male Ithaca, New York, September 3, 1913, A. D. MacGillivray collector; two males, Framingham, Massachusetts, September 9, 1915, and September 16, 1916, C. A. Frost collector; one male, Volo, Illinois, Tamarack bog, August 26-27, 1925, T. H. Frison collector; one male, Sioux City, Iowa, September 8, 1920, C. N. Ainslie collector; and one male Deadwood, South Dakota, September 9, 1925, H. C. Severin collector.

Holotype deposited in the collection of the author. Allotype deposited in the collection of The American Entomological Society, Philadelphia, Pennsylvania. One paratypic male deposited in the collection of the United States National Museum. Remainder of paratypes deposited in the collection of the author.

I name this color variety in honor of my mother, who was born and lived many years at the place where the holotype was collected.

Although this color variety occurs in the same nest with the typical *vagans*, as does likewise the color variety *coctus* (Bequaert and Plath), it is as deserving of a varietal name as many other color varieties. The fact that specimens colored like *helenae* are likely to be confused with other species is an additional reason for naming this variety. Specimens of this variety were included with the typic series of *consimilis* by Cresson, but since the lectotype of *consimilis* Cresson (Amer. Ent. Soc. number 2636) has the apical segments entirely black the name of *consimilis* unfortunately can not be used for this color variety.

Bremus cockerelli (Franklin)

1913. *Bombus cockerelli* Franklin, Trans. Amer. Ent. Soc., XXXVIII, p. 356. ♀ ☿.

A male of this species was recently found in material sent to me for identification. Since the male was unknown when Franklin (1913) published his description of *cockerelli,* and has remained unknown and undescribed, the following description is presented.

Male.—Face below and above the articulation of the antennae, occiput and occipital orbits with long yellowish pubescence. Malar space considerably longer than its width at articulation with mandible, slightly over one-third as long as greatest length of and about two-thirds width of the eye. Ocelli situated between eyes well above narrowest part of the vertex; lateral ocelli farther removed from each other than from inner margin of eye, space between each lateral ocellus and inner margin of eye smooth, impunctate and shining, except that there are a few punctures adjacent to the eye. Flagellum over two and one-half times as long as the scape, third and fifth segments almost subequal, fourth shorter than either.

Dorsum of the thorax with a poorly defined band of black pubescence between the wings, remainder of dorsum and pleurae covered with lemon-yellow pubescence.

Abdomen with the first and second dorsal segments covered with lemon-yellow pubescence, remaining dorsal segments covered with black pubescence. Ventral segments with sparse, long, lemon-yellow pubescence. Genitalia with general characters of the subgenus *Pratobombus;* heads of sagittae greatly dilated as in *B. vagans* (F. sm.); volsellae narrower at apex and with inner apical projection less prominent than in *B. vagans.*

Legs covered with long lemon-yellow hairs, except for the usual short, stout ferruginous setae on distal segments. Outer aspect of hind tibia convex, smooth, shining with only a few hairs, corbicular fringes yellow; metabasitarus three and one-half times as long as wide, but slightly concave.

Wings almost hyaline, lightest in middle portion.

Length, 15 mm.; spread of wings, 26 mm.; width of abdomen at second segment, 6 mm.

Allotype.—Male; Mt. Timpanogas, Utah, August, 1926, collected by J. W. Harrison. Allotype deposited in the collection of the author.

C. NEW SYNONYMY

Bremus vagans subsp. **bolsteri** (Franklin)

1913. *Bombus bolsteri* Franklin, Trans. Amer. Ent. Soc., xxxviii, p. 357. ♀ ☿.

1916. *Bombus bolsteri* Lutz, Bull. Amer. Mus. Nat. Hist., xxxv, p. 515. ♂.

A study of cotypic queens and workers of *bolsteri* (Franklin) in the collection of The American Entomological Society and the

United States National Museum has failed to produce tangible structural characters for the separation of this form from *vagans* (F. Sm.). The principal difference in color originally used as the basis for separating these two entities—the admixture of black pubescence with yellow on the dorsum of the pronotum—still gives, however, a constant character for the recognition of *bolsteri* from the typical *vagans*. Therefore, in the light of our present conceptions of species within this genus of bees, *bolsteri* must be considered either as a subspecies or as a color variety.

Accumulating records of the distribution of bumblebees in North America continue to confirm the restriction of *bolsteri* to Newfoundland and the absence there of the typical *vagans*. Evidently, then, *bolsteri* is a form farther along nature's path to species than a form differing but slightly in color characters from the typical species and occurring in the same region with the typical form, and liable to be found in the same nest with it. Forms of the latter category, I believe, are best referred to as varieties and forms of the status of *bolsteri* as subspecies.

Bremus frigidus var. **sandersoni** (Franklin)

1913. *Bombus vagans* subsp. *sandersoni* Franklin, Trans. Amer. Ent. Soc., XXXVIII, p. 353. ♀.

1923. *Bremus vagans* var. *sandersoni* Frison, Trans. Amer. Ent. Soc., XLVIII, p. 325. ♀.

1925. *Bremus vagans* subsp. *sandersoni* Bequaert and Plath, Bull. Mus. Comp. Zool., LXVII, p. 277. ♀.

In 1921, when making a comparative study of the genitalia of a large series of North American bumblebees, I first discovered that two species of males were going by the name of *vagans* (F. Sm.). A study since then of many specimens of the forms involved, including a restudy of cotypes of *couperi* (Cress.), *sandersoni* (Frankl.) and *consimilis* (Cress.) [= *vagans* F. Sm.], has led to the conclusion that the form described as *vagans* subspecies *sandersoni* (Frankl.) is merely a color variety of *frigidus* (F. Sm.).

B. vagans subspecies *sandersoni* was originally described from he queen caste only and separated from *vagans* on the basis of he "distinctly finer texture" of its pile and the fact that the malar space was "not longer than its width at apex." Automatically, then, *vagans* became a species complex with a typical form having a long malar space and a subspecies with a short malar space. No such marked variation in the length of the malar space has been ascribed to any other North American species of bumblebee, and my studies of many thousands of specimens of most of our species indicates that such a marked variation in the length of this structure is unusual if it ever occurs. It is true that the malar space of a species is subject to some variation in length, but this variability is usually within rather narrow limits. (Frison, 1927.)

Discarding the hypnotic influence of similarity in colors and the color pattern of *vagans* and the form *sandersoni*, a search was made for a structural homologue of *sandersoni*. The females of the species frigidus (F. Sm.) were found to be structurally identical with the females of *sandersoni;* possessing the same fine texture of pubescence, a species of small size, a similar malar space, and a decided notch on the lower mesal margin of the mandibles (much less pronounced in *vagans*). The only observable difference between them being that *frigidus* possessed a black band between the wings and the apical segments were more or less ferruginous, whereas *sandersoni* lacked the black band between the wings (some black hairs on the disk) and the apical segments were blackish or with a trace only of light colored hairs.

A study of a series of females of *couperi* (Cress.), a form long suspected of being a variety of *frigidus*, soon showed that it, too, was a structural homologue of both *frigidus* and *sandersoni*. In the matter of coloration it was intermediate between the two; in that the black band between the wings showed a tendency towards reduction and the pubescence of the apical abdominal segments was whitish, yellowish or nearly black.

The conclusive evidence of the relation of *sandersoni* and *frigidus*, however, has been provided by a study of males. When *sandersoni* was originally described no males were associated with the cotypic queens. As previously stated, the discovery in 1921 of two structurally different males masquerading as *vagans* was conclusive evidence of a confusion of species under the ame *vagans.* In view of the relationships evident by a study of emales of *frigidus, couperi* and *sandersoni* a comparative study f the males was made.

It was found that one of the distinctive characters of the male of *frigidus* was the gradual enlargement in diameter of the lagellar segments from their distal to proximal end and the presence of feeble tufts of closely placed setae on the outer side of the basal segments (a character particularly pronounced in a related western species—*mixtus* Cress.). The males of *couperi* (unknown in 1914 but described by Frison in 1919) were found to possess similar characters and also certain males similar in color characters to *vagans.* A study of the genital characters of the males has likewise confirmed the specific identity of *frigidus, couperi* and certain males similar in color to *vagans.* Although the difference in the genitalia of species belonging to the *vagans* and the *frigidus* complex is slight, a matter of relative size and shape of the volsellae and their protrusion beyond the squamae, the structural details concerned have proved constant in the series studied.

It is evident from these comparative studies of the males and females of *frigidus* and *couperi* that the males and females colored like *vagans,* and structurally identical with the males and females of the former, are the opposite castes of the same form. This is confirmed further by their distribution. Females of *sandersoni* are known to me from New Hampshire, Massachusetts, New York and Michigan. The males which I am now associating with this form are from New Hampshire, Massachusetts, Wisconsin, New York and West Virginia. A visualization of the distribution of *frigidus* and its variety as a single entity is even more conclusive.

The only conclusion permissible from the above facts is that *couperi* and *sandersoni* are color varieties of *frigidus.* The ferruginous-tailed *frigidus* is the more northern variety of the species (reddish-tailed forms are northern or high mountain forms as a group) and is found in Labrado, Northern Canada, Alberta, Alaska and at high altitudes in the western part of the United States. The yellowish or whitish-tailed variety *couperi* is inclined to be more southern in distribution and is found as far south as northern Michigan and on isolated high mountains of the Appalachian system. The variety *sandersoni* is a more southeastern form with a distribution as already outlined. The species *frigidus* and its varieties thus present us with an excellent example of the effect of climatic influences upon the colors of the pubescence of bumblebees.

The discovery of *frigidus* masquerading in the northern and northeastern United States in the livery of *vagans*, the specific identity of *couperi* and *frigidus*, and the finding by myself of *sandersoni* in Wisconsin, remove all doubt as to the authenticity of the Illinois record of males of *frigidus* from northeastern Illinois.[1]

Since the specific relationships of *sandersoni* have been confused and the cotypic series consisted of "seventeen queens", a *lectotype* of *sandersoni* Franklin has been selected from cotypic queens in the collection of The American Entomological Society at Philadelphia to help prevent possible confusion in the future. The data associated with the specimen selected as a *lectotype* are as follows: Durham, N. H. [New Hampshire], W. and F., 3128, Type 10360.

Bremus frigidus var. **couperi** (Cresson)

1878. *Bombus couperi* Cresson, Proc. Ac. Nat. Sci. Phila., p. 185. ♀.

1919. *Bremus couperi* Frison, Bull. Amer. Mus. Nat. Hist., XLI, p. 452-453. ☿ ♂.

1923. *Bremus frigidus* Frison, Trans. Amer. Ent. Soc., XLVIII, p. 324. ♀.

1924. *Bremus couperi* Frison, Can. Ent., LVI, No. 12 (December), p. 294. ♀ ☿ ♂.

1926. *Bremus couperi* Frison, Trans. Amer. Ent. Soc., LII, p. 134. ♀.

1928. *Bremus couperi* Frison, Can. Ent., LX, No. 10 (October), p. 237. ♀.

As already stated in my remarks concerning the assignment of *sandersoni* to a variety of *frigidus*, the form *couperi* is structurally indistinguishable from *frigidus*. Since it differs from the typical form in minor color characteristics only (restriction of black on dorsum of thorax and tendency of apical abdominal segments to be white, yellow or black), it is best classified as a color variety. Doubt as to the distinct specific validity of *couperi* was expressed by Franklin (1913), but it was left standing in our list as a good species.

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[1] Trans. Ill. Sta. Acad. Sci., Vol. XII, 1919, p. 159.

My record (1923) of *frigidus* from "Thunderhead Mountain, 6000 ft. altitude, Blount County, Tennessee, one female, August 4, (H. A. Pilsbry)" has been placed in the synonymy of *frigidus* var. *couperi* because of a restudy of this specimen. My original diagnosis of the species involved was correct (*couperi* and *frigidus* one species), but since then I have cleaned the originally badly matted specimen and the pubescence of the apical abdominal segments proves to be yellowish instead of ferruginous.

As mentioned in my discussion under *frigidus* var. *sandersoni*, the lectotype (No. 2169) of *couperi* in The American Entomological Society has been studied.

Bombias Robertson

1922. *Nevadensibombus* Skorikov, Bull. Sta. Regionale Protect. Plantes Petrograd, IV, Part I, November.

1927. *Nevadensibombus* Frison, Trans. Amer. Ent. Soc., LIII, p. 63.

The name *Bombias* was originally proposed by Robertson (1903) for a group of bumblebees which he thought of generic status and *B. auricomus* Robertson designated as its genotype (original designation). Later it was reduced to subgeneric status by Franklin (1913). In 1922, Skorikov proposed the generic name of *Nevadensibombus* for the natural complex of bumblebees containing the two North American species of *nevadensis* Cresson and *auricomus* Robertson and by implication (absolute tautonymy) made *nevadensis* Cresson its genotype.

In accordance with the International Rules of Zoological Nomenclature the name of *Bombias* in a restricted sense must be retained for the complex containing the species *auricomus* Robertson (Articles 6, 7, 9, 29, 30). Therefore, since *nevadensis* and *auricomus* belong to the same subgenus, in fact are very closely related, *Bombias* must be substituted for *Nevadensibombus* Skorikov regardless of whether this complex is considered as a genus or subgenus.

ADDENDA

Frequent use of certain articles by myself published in the Transactions of The American Entomological Society have revealed certain errors which should be corrected. They are as follows:

Vol. XLVIII, March, 1923, p. 322, substitute *Franklin* for *Cockerell* in lines 10 and 18 from the top; p. 326, substitute *Franklin* for *Cockerell* in line 4 from the top.

Vol. LII, July, 1926, p. 130, substitute *H. C. Severin* for *H. A. Scullen* in line 11 from the top; p. 137, delete *Rabbit Ear Pass* in line 2 from the bottom, since this locality is in Colorado instead of Oregon; p. 142, substitute *Kirby* for *Nylander* in line 15 from the top.

Vol. LIII, May, 1927, p. 66, substitute *Skorikov* for *Krüger* in lines 15 and 16 from top of the page. Although the subgenus *Alpinobombus* was credited to Krüger by Krüger (1920), I find that a subgenus with a similar aggregate of species was given the same name by Skorikov (1914); p. 67, line 21 from the top should read *B. bimaculatus (Cress.) and varieties ridingsii (Cress.)*, etc.; p. 69, in line 5 from the top substitute *Bingham, 1897* for *Franklin, 1913*; p. 63, substitute *Bombias Robertson (1903)* for *Nevadensibombus Skorikov (1922)* in line 12 from the bottom; p. 78, substitute *Bombias Robertson* for *Nevadensibombus* Skorikov in caption associated with figure 6.

THE EXTERNAL MORPHOLOGY OF PEPSIS ELEGANS LEPELETIER

(HYMENOPTERA: PSAMMOCHARIDAE)

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INTRODUCTION

One of the most evident facts in the study of many of the systematic groups of insects is the lack of uniformity in the nomenclature used by the workers to describe the various morphological features of the insects concerned. This was especially noticeable when an attempt was made by the writer to complete a systematic revision of the genus *Pepsis* and the desirability of a detailed, purely morphological study of some one species of the genus was realized. It is hoped that, by the study which follows, the nomenclature will be clarified and the morphological status of the various structures which have been misnamed heretofore will be determined. It is also hoped that morphological characters of specific value will be found which can be substituted for the color characters that have been used to a great extent by previous workers, for morphological characters are considered to be the more desirable.

The paucity of material available for study led to the selection of the species *Pepsis elegans* Lepeletier of which a greater amount of material was available than was the case with other species. This is somewhat unfortunate for *P. elegans* has not been considered as recognizable by a number of systematists working on the group because of a seeming discrepancy between the descriptions of most specimens which are to be referred to this species and the original description of the male in which it is stated of the abdomen "...Segmentorum secundi, tertii, quinti, sextique

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[1] Contribution from the entomological laboratory of the Massachusetts Agricultural College, Amherst, Mass.

margo posticus linea ferruginea tenui ferrugineo pubescenti terminatus..." (Lepeletier, 1845, p. 489.). Smith (1855, p. 201) took the view that "...the red margin of the abdominal segments of the male, as described by St. Fargeau, is attributable to the irridescence of the pile, and is most observable in sunlight.", which view has been accepted by most of the recent workers who consider *P. elegans* to be a valid species. The writer has accepted Smith's view and the following morphological study is based on specimens which can be referred to *P. elegans* according to that view.

The writer wishes to express his indebtedness for the invaluable help given by Dr. G. C. Crampton in the morphological study and to Dr. H. T. Fernald for his help in procuring material for study and for his many valuable suggestions. To Dr. C. P. Alexander the writer wishes to express his appreciation for the help given him in correcting the manuscript.

General Appearance and Color

Considering the relatively large size of most of the species of the genus, *P. elegans* is a medium to small-sized species. The general color of the entire body is black, but its surface is covered with a short, dense pubescence or pile which, in certain lights, gives it a purplish color. Long hairs, although present, are not conspicuous in a general survey except in the case of male specimens in which there occurs a so-called ventral hair brush (discussed later) on the ventral surface of the abdomen. From the second segment on, the antennae are of a yellow or reddish-orange color. They are usually held porrect in male specimens and are loosely coiled in female specimens. The legs are very long in proportion to the size of the body and are of the same color as the body. The wings are large and, when at rest, extend along the dorsum beyond the tip of the abdomen. They are blackish in color, usually showing a violet or purplish over color or shimmer when seen in certain lights.

Head and its Appendages

The head of the male is slightly more than half the size of that of the female and its features are less ruggedly and strongly developed than are those of the female. The head, when viewed from in front, is roughly circular in shape, but it is flattened dorsally at the vertex and is prolonged ventrally by the mouthpart structures. The sutures which limit the various sclerites concerned in the formation of the head capsule in other insects are, for the most part, greatly altered or missing in *P. elegans* because of the modifications which have taken place. Accordingly, some of the terms used in this paper are connotative of areas of the head capsule rather than of definite sclerites.

Head capsule.—(Pl. I, figs. 1 & 2). The *epicranium* (Ep) and *frons* (f) occupy the greater portion of the frontal aspect of the head and extend cephalad of the *occipital suture* (os) to the *fronto-clypeal suture* (fc). These two sclerites are considered together, for there is some question as to the exact location and identification of the lateral arms of the epicranial suture which ordinarily form the lateral limits of the frons. If we are to accept the idea of the migration of the lateral arms of the epicranial suture advanced by Stickney (1923) in his study of the head capsule of Coleoptera, as occurring in the same manner in Hymenoptera, it is probable that the small triangular sclerite which has been called the frons in this paper is all that remains of this sclerite. The lateral arms of the epicranial suture now may be represented by the sutures laterad of the frons. The thickenings which occur on the ental surface of the head capsule in this region would bear out the above conclusion, but, in the absence of any study which would show such a migration in a graded series of forms, this is not to be considered certain, though probable.

The three *ocelli* (o) are found near the dorsal surface of the head on a flattened portion of the vertex. They are equidistant, one from another, and form the points of an isoceles triangle. The anterior ocellus is slightly larger than the two posterior ocelli and is situated on the median line at the dorsal terminus of the *epicranial suture* (es). The epicranial suture is incomplete in that it does not extend posteriorly to join the occipital suture, but ends at the anterior ocellus. It forms a median longitudinal furrow passing forward from the anterior ocellus between the *antennal sockets* (a) to a point ventrad of them where it divides into two lateral arms (probably to be considered as the *true* lateral arms of the epicranial suture) which join the fronto-clypeal suture. One *antennifer* (an) is found in each antennal socket as a heavily chitinized projection from the ventral outer margin of the socket.

The *furcal pits* (fp), which lie on the fronto-clypeal suture, are well defined and deep depressions that outwardly mark the positions of the anterior arms of the tentorium. The *fronto-clypeal suture* (fc) is clearly defined for the most part, but its lateral prolongations near the furcal pits are indistinct. As determined by a study of the thickenings found on the ental surface in this region, the lateral prolongations of this suture follow a course dorsad to the furcal pits, then extend obliquely ventrad to the dorsal lateral angles of the clypeus.

The *clypeus* (C) is broadly convex, with its apical margin arcuately concave and its distal lateral angles broadly rounded. The *compound eyes* (E) are large, protuberant, and reniform in shape, the inner margin being the concave one. They form important features of the frontal aspect of the head and extend from points on a line drawn transversely to the dorso-ventral axis of the head through the hind ocelli, nearly to the lateral ventral margins of the head near the points of articulation of the mandibles.

The *genae* (G) are the general areas forming the "cheeks" or sides of the head capsule. They extend anteriorly to the clypeus as small, narrow strips ventrad of the compound eyes. The genae, together with the *postgenae* (Pg), are strongly rounded, the two pairs of sclerites together forming a large portion of the latero-posterior area of the head capsule. There is no evidence of definite sutures dividing these areas into genae and postgenae and it is probable that these two pairs of sclerites have become fused.

The *occipital suture* (os) is present on the posterior surface of the epicranium as a semicircular, carina-like ridge extending around and above the *occiput* (oc), thus separating the occiput from the *vertex* (v) or general dorsal region of the epicranium. The occiput surrounds the *foramen* (fo) and fuses with the postgenae somewhere ventrad of the foramen. It is somewhat watchglass shaped, being concave in its central portion, and completely encircles the foramen as a raised rim to which are attached the *occipital processes* (Pl. II, figs. 12 & 14, op) of the prothorax.

The gular area, which is found at the ventral terminus of the *gular suture* (gs) and is sometimes called the *pregula* (gb) or gular bar, is seen as a small, mesal, triangular plate in the trophicava (discussed later), beneath, but fused with the raised carina-like margin of the postgenae.

The *trophicava*[2] (tc) is a broad semicircular depression or cavity in the ventral margin of the postgenae into which the basal portions of the maxillae and labium are inserted.

Tentorium.—(Pl. I, fig. 3.) The endoskeleton of the head is known as the tentorium. In *P. elegans* the three pairs of apodemes, which are known respectively as the *posterior arms* (pa), the *dorsal arms* (dt) and *anterior arms* (at) are clearly defined. The *body* of the tentorium (bt), however, is not as clearly demarked and seems to include only that portion of the endoskeleton which is immediately cephalad of the foramen and which is formed by the fusion of the anterior and posterior pairs of apodemes. Figure 3 is a lateral view of a longitudinal section of the head along its median axis and shows only one half of the endoskeletal structure.

The posterior arms arise from slight invaginations laterad of the base of the rim surrounding the foramen and the pair forms a free arch over and cephalad of the foraminal aperture. (Only one arm is shown in the figure, the plane of section cutting the arch in the center.) The attachments of the anterior arms are marked on the frontal aspect of the head by the furcal pits (Pl. I, fig. 1, fp). Each anterior arm extends backward as a long bar from the ental surface of the head capsule at the base of each furcal pit, to the body of the tentorium. The dorsal arms are somewhat modified in that they do not extend from the body of the tentorium as distinct structures, but one arises from the middle portion of the dorsal surface of each anterior arm and soon becomes so thin and so slightly chitinized as to appear tendon-like and indistinct.

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[2] The term "trophicava" has been used in place of MacGillivray's term "maxacava" as being more accurately descriptive of facts, for the trophi are inserted in the cavity. MacGillivray's term would indicate that the maxillae alone were concerned.

Antennae.—(Pl. I, figs. 8, 9, 10.) The antenna of the female is composed of twelve segments while that of the male has thirteen. The first, or basal segment, is known as the *scape* (sca). The second is known as the *pedicel* (pd) and the remainder of the segments are known collectively as the *flagellum* (fl). The scape, the pedicel and occasionally the base of the first flagellar segment are of a dark brown color while the remainder of the antenna varies in color from a light yellow to a reddish-orange, the darker color being found more commonly in male specimens. The female ordinarily holds the antennae with the flagellum loosely coiled while the flagellum of the male is usually porrect. The scape is modified proximally to form a bulb while the pedicel is a small, ring-like segment and the flagellar segments are nearly cylindrical and sub-equal in length. In the female the scape is the thickest segment of the antenna while, in the male, it is narrow and short, being as short as any of the flagellar segments.

In the female the sensory cells of the antenna are not grouped as they are in the male although there appears to be a somewhat regular band of sensory cells along the inner lateral surface of many of the flagellar segments. This band is usually rather poorly defined. In the male there is a definite grouping of the sensory cells into proximal and distal elongately triangular areas (Pl. I, fig 10) which usually occur on segments four to ten inclusive, although a sensory area may also occur on the other segments of the flagellum. The sensory areas are roughly triangular in outline, are somewhat depressed, and vary in size on the different segments. The surface of each area lacks the minute hairs which are to be found on the other portions of the antennal surface and the sensory cells appear as small, brownish spots on the surface. These cells appear to be of the "sense peg" type, but no attempt has been made in this study to investigate their structure.

Labrum.—(Pl. I, fig. 1, la.) This is attached to the inner surface of the clypeus by membrane and usually is not exserted. It is rounded in outline and the somewhat truncate apical portion is deflexed posteriorly. A fringe of strong, black spines, flanked on each side by longer slender ones, is found along the margin of the plate and, in the female, a few short spines are scattered over the apical portion of the deflexed surface. A membranous structure known as the *epipharynx* (Pl. I, fig. 1, epi) is attached to the posterior surface of the labrum. It is rectangular and somewhat larger than the labrum and extends into the oral cavity as a purse-like fold. The oral aperture is found just caudad of the epipharynx.

Mandibles.—These are conspicuous and well developed. They are placed just behind the epipharynx, one on each side of the mouth opening. Each (Pl. 1, fig. 4) is curved and tapers gradually to a blunt apex. A strong, blunt tooth (t) is borne on the inner margin about a third of the distance from the apex of the mandible. Four groups of long setae are found on each mandible, the most noticeable of which, consisting of six setae, occurs in a groove just basad of the tooth on the inner face. Two other groups are found on the ventral face of the mandible and a fourth group occurs near the middle of the lateral face.

Each mandible articulates on two ball and socket joints, one anterior and the other posterior. The mandibular portion of the *anterior articulation* (ah) consists of a shallow socket at the anterior terminus of the basal margin of the lateral surface. A slight ball-like protuberance of the extreme lateral and basal angle of the clypeus fits into the mandibular socket and completes the joint. The *posterior articulation* (ph) is well developed, the mandibular portion consisting of a condyle at the posterior terminus of the basal margin of the lateral surface which fits into a socket or depression in the latero-ventral margin of the postgena. Each mandible is moved by two muscles. The inner and larger, which is called the *flexor* (fx), is attached to the basal margin of the inner surface of the mandible. The smaller muscle, which is called the *extensor* (ex), is attached on the inner surface of the basal margin of the lateral surface of the mandible just cephalad of the posterior articulation. These muscles allow only transverse movement, the flexor closing and the extensor opening the mandibles. When not in use the tip of one mandible extends over and covers the tip of the other. There seems to be no special arrangement as to which mandible is the outer for, in the specimens examined, the right seemed to cover the left about as often as the left covered the right.

Maxillae.—These occur just behind the mandibles, one on each side just in front of the labium which is the posterior mouth-part structure. When the labium and the maxillae are not being used in feeding (i. e., when they are not extended) they are folded under the head in a protected position. When they are extended, however, they form a tube-like structure.

In each maxilla (Pl. I, fig. 5) the *cardo* (ca) is heavily chitinized and is modified basally to form two knob-like projections, the shorter of which fits into a socket on the ental surface of the postgena. Evidences of a point of attachment for a lorum are to be seen under the inner margin of the cardo, but a lorum connecting the cardines of the maxillae is not demonstrable. The main portion of the plate known as the *stipes* (sti_1) is elongately triangular and bears, on its outer margin, a six-segmented *maxillary palpus* (mxp) at the base of which is a membranous, inconspicuous palpifer. (Another view is that the maxillary palpus consists of but five segments, the one here considered to be the basal palpal segment being called the palpifer.) The inner margin of the main surface of the stipes is raised and ridge-like and a secondary inner extension of the stipes (sti_2) occurs as an irregularly chitinized area at a level different from that of the main portion of the stipes. The *galea* (ga) and *lacinia* (lc) are attached to this extension. The lacinia is small, membranous and pad-like while the galea is rather heavily chitinized and consists of what appear to be two closely appressed and fused plates which may be all that remains of an ancestral condition in which a distinct endogalea and exogalea were present. A short, chitinized bar, which is called the *interlorum* (Pl. I, fig. 6, il), extends to the *hypopharynx* (hyp) from near the point of meeting of the bases of the lacinia and the galea and the inner extension of the stipes. The interlorum is also attached to the flexor muscle of the mandible near the base of the mandible by a broad, flat, chitinized band which seems to be a secondary prolongation of the interlorum.

Labium.—(Pl. I, fig. 2.) The *submentum* (sm), which is the small basal plate on the posterior surface of the labium, is peltate in form and fits between the cardines and stipites of the maxillae. The *mentum* (mn) occurs just distad of the submentum as a large, strongly rounded, heavily chitinized plate, the basal lateral portions of which are elongated and bent over in such a manner as to extend anteriorly to meet the hypopharynx which is situated on the anterior surface of the labium. The distal margin of the mentum is cut away on each side in such a manner as to furnish cavities in which occur the membranous palpigers, to each of which is attached a four-segmented *labial palpus* (lp). The mentum of the labium is protected on each side by the stipes of a maxilla when the mouthparts are extended. The *glossa* (gl), which is a large pad-like structure, occurs distad of the mentum and, together with the *paraglossae* (pgl), one of which occurs on each side of the glossa, is joined to the mentum by membrane. The distal portion of the glossa is bilobed and covered with short, plush-like hairs on its anterior surface while the posterior surface lacks this covering. The middle portion of the anterior surface of the glossa is crossed by numerous transverse striations which may have some function in the process of "lapping up" the food of the adult. The posterior surface of the glossa lacks these striations, but bears longitudinal striations instead. Two areas, more heavily chitinized than the remainder of the glossa, occur on the dorsal surface near the base. The functions of these areas are not known. The paraglossae are membranous. Each bears a few short hairs near the tip and, on the posterior surface near the base, a pad-like pubescent area occurs. A small, membranous, papilla-like protuberance, which is the distal portion of the *hypopharynx* (Pl. I, fig. 7, hyp), occurs on the median line of the anterior surface of the labium just basad of the proximal portion of the glossa. The identity of the hypopharynx is determined by the presence of the opening of the salivary duct just behind the distal papilla-like protuberance.

THORAX AND ITS APPENDAGES

The thorax (Pl. II, figs. 11 and 12) is of the peculiar humped-back shape typical of the members of the family Psammocharidae. Snodgrass (1910), in his paper on the thorax of Hymenoptera, has worked out the homologies of the various sclerites and Crampton (1914 and 1926) has made important contributions to the knowledge of the homologies of the sclerites found in the neck region and in the tergum.

Prothorax.—The *pronotum* (Pn) is a relatively broad, transverse plate. Its front margin covers the points of attachment between the head and the internal *occipital processes* (Pl. II, fig. 12, op) or cephaligers of the *latero-cervicals* (L) and its hind margin is arcuately concave and overlaps the front margin and prephragma of the *prescutum* (Pr). The anterior lateral corners are bluntly pointed and the posterior angles are broadly rounded and form lobes which cover the mesothoracic spiracles lying just underneath on the anterior margins of the *mesepisterna* (Eps_2). The latero-cervicals form the greater part of the broad, flat, antero-ventral surface of the prothorax. Each latero-cervical extends anteriorly to form a portion of a collar-like, transverse band from the inner surface of which projects a chitinized tooth called the *occipital process* (op) on which the head articulates. A hook-like projection, which is called the *coxal process* (cp_1), is found on the ental surface of each latero-cervical near the lateral posterior angle of the sclerite and this projection forms a part of the apparatus for the attachment of the *coxa* (Cx_1) of the fore leg. The *prosternum* (S_1) is seen as a small, transverse, triangular plate attached to and basad of the hind margins of the latero-cervicals. The *furcisternum* (fs_1), which is caudad and dorsad of the sternum and which forms the broad, rounded lobe between the front coxae, is the base to which the sternal apophyses of the endoskeleton of the prothorax are attached.

Mesothorax.—The tergum of the mesothorax is divided into a *prescutum* (Pr), *scutum* (Sct), *scutellum* (Scl), and *parascutellum* (Psc). The prescutum is the large, arched, anterior plate of the segment which is considered to be fused posteriorly with the scutum. The lateral portions of the scutum are separated from the prescutum by the so-called *parapsidal grooves* (pf), the areas so marked off being known as the parapsidae although they are portions of the scutum. The parapsidae are deeply excavated and the *tegulae* (tg) and fore wings are attached to them. The scutellum is a transverse sclerite which forms the broadly rounded, nearly triangular, elevated, median area caudad of the scutum. Laterad of the scutellum are the *parascutella* (Psc) which are deeply excavated and are separated from the scutellum by a secondary carina-like ridge. In some species of the genus *Pepsis* a secondary transverse suture, which is the external evidence of the attachment of the entodorsum (called the ventral V-shaped ridge of the notum by Snodgrass) at this point, is visible just caudad of the scuto-scutellar suture. This gives the appearance of there being a distinct sclerite lying between the scutum and scutellum. In *P. elegans,* however, this suture is not present as a distinct line. The *postscutellum* (Pl. II, figs. 14 and 15, pn_2) or postnotum of the mesothorax is not visible on the surface of the thorax and will be discussed later in connection with the endoskeleton of the thorax.

The lateral and sternal sclerites of the mesothorax are fused and modified so as to make their identification rather difficult. The *mesepimeron* (Epm) is considered by Snodgrass to border the postero-dorsal margin of the episternum. In *P. elegans* the line of division between the episternum and epimeron is not clear, but study suggests that the narrow, somewhat pitted band, which lies along the postero-dorsal margin of the mesepisternum, is the mesepimeron. The mesepisternal and mesosternal sclerites are continuous, there being no complete suture dividing these sclerites. The *mesepisternum* (Eps_2) is divided into two portions by a secondary furrow called the *median episternal groove* (mpg). The dorsal portion of the mesepisternum borders the front coxal cavities and is, in turn, bordered on its postero-dorsal margin by the mesepimeron. The ventral portion of the mesepisternum is fused to the *sternum* (S_2), no definite line of demarkation being present between the two sclerites. There is a median longitudinal groove on the sternum which is the external evidence of the line of attachment of the apophyses of the mesothoracic endoskeleton. The pleuro-sternal plate (mesepisternum plus sternum and furcisternum) is modified posteriorly to form the *coxal process* (cp_2) which projects into the mesothoracic coxal cavity from its anterior margin. The *coxa* (Cx_2) of the mesothoracic leg articulates on this projection. Mesad of the cosal processes of the pleuro-sternal sclerites is found a rather poorly defined sclerite known as the *furcisternum* (fs_2) which forms the base to which a portion of the sternal apophyses of the endoskeleton of the mesothorax is attached. A tuberculate elevation, which has been called the ***mesopleural tubercle*** (mt) by systematists, occurs on the surface of the pleuro-sternal sclerite near the lateral margin of the ventral surface.

Metathorax.—The tergum of the metathoracic segment is divided into two parts which are called the ***metanotum*** (N_3) and the ***metapostscutellum*** or ***metapostnotum*** (Ms). The metanotum is a long, curved, transverse, band-like sclerite which bears an elevation in the middle of its dorsal surface and terminates laterally at the points of attachment of the hind pair of wings. The metapostscutellum is not separated from the ***metapleura*** (Pl) by a suture, but the statement made by Snodgrass concerning this sclerite that "..the upper parts of the metapleura are nearly always fused with the lateral parts of the metapostnotum.." (Snodgrass 1910, p. 79) applies in this case. Thus we may consider the metapostscutellum to be the saddle-like band which extends over the dorsum between the metanotum and propodeum and which is partially fused posteriorly with the propodeum and completely fused laterally with the metapleura. A deep, longitudinal groove cuts the metapostscutellum in the middle, the groove being the external evidence of the line of attachment of a part of the endoskeleton. A depression of similar origin is found on each side at the hinder margin of the sclerite near the hypothetical point of fusion of the metapleura with the metapostscutellum.

The pleurum of the metathorax is considered to be made up of one sclerite, the *metapleurum* (Pl), which is divided into two parts by a secondary suture. The upper portion is fused above with the metapostscutellum and, at the tip of its anterior dorsal angle, is a small sclerite which bears the *spiracle* (si) of the metathoracic segment. The secondary suture, which separates the upper from the lower portion of the metapleurum, ends posteriorly in a deep depression. The posterior margins of the lower portions of the metapleura form the lateral margins of the metathoracic coxal cavities. The posterior inner angles of the metapleura are prolonged and fused with portions of the ***metasternum*** (S_3) and ***furcisternum*** (fs_3) to form the coxal processes (cp_3) on which the *coxae* (Cx_3) of the hind legs articulate.

A lateral, longitudinal carina, extending from the posterior margin of each mesothoracic coxal caxity to the sterno-pleural coxal process of the metathorax, probably indicates the line of fusion of the pleurum and the sternum. There is a median longitudinal groove in the metasternum, similar to that found in the sternum of the mesothorax, which is the external evidence of the line of attachment of the sternal apophyses of the metathorax. Caudad of the sternum is found a broadly triangular sclerite which is known as the *furcisternum* (fs_3) which also bears a portion of the sternal apophyses on its inner surface.

Endoskeleton of the thorax.—(Pl. II, figs. 14-18.) The inner surface of the chitinous skeleton of the thorax is greatly modified to provide attachments for the muscles of the wings and legs or extra "braces" to withstand the strains to which the chitinous plates are subjected when the insect is in flight. These internal thickenings or bars are called phragmas, if attached to the tergites; apodemes if attached to the pleural plates; or apophyses if attached to the sternal plates.

The *prescutum* (Pr) is prolonged anteriorly to form a *prephragma* (phg_1) which extends for some distance under and caudad of the *pronotum* (Pn). It extends as a roll-like thickening along the ventral anterior and lateral margins of the prescutum and scutum and is flattened to form a thin, plate-like lobe on each side of the middle of its anterior margin. A thickening occurs near the anterior margin of the scutellum which Snodgrass (1910) calls the *ventral V-shaped ridge of notum* (vnr). Its presence is marked on the dorsal surface of the scutellum by the transverse groove already referred to in the previous discussion of the scutellum. The ridge is seen to be situated near the front margin of the ventral surface of the scutellum and is narrower across its dorsal portion and broader near its lateral extremities dorsad of the points of attachment of the fore wings. The posterior margin of the scutellum is folded inward and an internal ridge is formed along the margin. The *postscutellum* (pn_2) of the mesothorax is entirely internal and occurs as two, separated, flat, scale-like lobes, one of which occurs on each side just caudad of the posterior margin of the scutellum and dorsad of the point of attachment of the hind wing. The postscutellum may extend dorsally along the posterior margin of the scutellum as a very narrow, chitinous strip, but this is not distinct and the two lateral portions apparently are separated. The *postphragma* (phg_2) of the mesothorax is well-developed and large. It extends caudad nearly to the inner surface of the hind margin of the *propodeum* (Pro) as a canopy-like, weakly chitinized plate which tapers posteriorly. The anterior margin of the postphragma is joined to the median posterior margin of the scutellum and the posterior margins of the lateral postscutellar plates. The lateral, thickened rim of the postphragma is attached to the lateral margins of the postscutellar plates. The postphragma lies dorsad of the apophyses of the mesothorax and passes through the central opening formed by the thickenings to be found on the inner surface of the exoskeleton along the line of fusion of the metapostscutellum and the propodeum and the apophyses of the metathoracic endoskeleton.

The *metanotum* (N_3) is folded inward so as to form a hollow, tube-like structure across the median part of the dorsum. Laterally the inner fold is modified to form a thin, phragma-like structure on each side of the median, tube-like formation and this phragma-like structure extends caudad from the front margin of the metanotum as a chitinous plate. The line of fusion between the metapostscutellum and the propodeum is marked on the inner surface by a thickening or infolding of the chitin. The depressions which were mentioned above in the discussion of the external characters of the sclerites concerned are also marked by chitinous thickenings which extend cephalad of the main internal ridge as short prolongations of the ridge. The outlines of the various sclerites which enter into the composition of the thorax appear, for the most part, on the inner surface of the exoskeleton as thickenings of the chitin along the line of meeting of the two adjoining sclerites or as thickenings running parallel to and just inside of the margins of the sclerites.

As a rule, the endoskeletal projections of the pleural and sternal sclerites are fused to form a rather complicated structure so that it is more logical and convenient to consider the pleural apodemes and the sternal apophyses of one thoracic segment at the same time than to consider the apodemes and apophyses separately.

A structure known as the *occipital process* (op) occurs on the inner surface of each laterocervical near its anterior margin. This structure is not connected with that formed by the fusion of the apodemes and the apophyses which occurs near the posterior margin of the laterocervical and which is attached to the furcisternum and sternum of the prothorax. Plate II, figure 14 shows the endoskeletal structure on the prothorax in cross section while Plate II, figure 16 shows the caudal aspect of the prothoracic endoskeleton. The furcisternum occurs as a plate dorsad of and fused with the sternum. The *sternal apophyses* (sa_1) occur as two erect bars, one ôn each side of the dorsal surface of the furcisternum. They are fused together at their apices so that a mesal aperture is formed between them. A dorsal prolongation of the apophyses extends posteriorly dorsad of the mesal aperture as a pointed lobe. Each apophysis extends laterally to meet with the pleural *apodeme* (pa_1) which lies along the inner surface of the posterior margin of each laterocervical and which terminates ventrally just above the *coxal process* (cp_1).

That portion of the endoskeleton of the mesothorax which is formed by the apodemes and apophyses may be described as follows (Pl. II, fig. 17). The *apophyses* (sa_2) are fused together at the base and arise as a single, erect, median and longitudinal plate the basal margin of which extends along the median line of the mesosternum and furcisternum. The distal portion of the plate is divided into two pairs of arms which extend laterally to fuse with the *apodemes* (pa_2). The most conspicuous portions of the apophyses are a pair of anterior arms, each of which extends from an internal ledge (the apodeme) just ventrad of the dorsal inner margin of the fused mesepimeral and mesepisternal sclerites obliquely caudad to the point of fusion with the other anterior arm. A transverse, weakly chitinized plate occurs just cephalad of the point of fusion of the two arms. A pair of weakly chitinized (almost tendon-like) posterior arms arise, one on each side of the point of fusion of the anterior arms, and each extends obliquely caudad to become attached near the posterior terminus of the apodeme.

In the metathorax (Pl. II, fig. 18) the ***sternal apophyses*** (sa_3) are fused near the base as in the mesothorax and are separated above to form two arms which extend obliquely dorsad to meet the *pleural apodemes* (pa_3). The anterior margin of the fused bases of the apophyses terminates at the raised anterior margin of the metasternum. The apodemes are not distinctly separated from the internal ridge, which is found along the line of fusion of the propodeum and metapostscutellum, but seem to form continuations of it extending ventrad across the inner surface of the pleural sclerites to meet the raised anterior margin of the sternum. That portion of the ridge formed by the apodemes is much more developed than the other portions and it extends into the body cavity to a much greater extent than do those parts formed by the anterior margin of the metasternum or by the line of fusion of the propodeum and metapostscutellum.

Legs.—The legs of this species are very long in proportion to the size of the body. In common with most of the exterior chitinous surface of the insect, the surface of the legs bears a short pubescence. On the inner surface of the tibia of the hind leg a long, plush-like pad of short hairs is found which extends from near the base to the apex of the tibia. In female specimens the tibiae bear numerous irregularly placed, sagitta-shaped spines as well as numerous finer ones and, on the outer surface of the middle and hind legs, is a row of blunt, tuberculate teeth at the base of each of which is a heavy, sharp spine. The legs of male specimens are much less heavily and more sparsely spined than those of females and the blunt teeth are absent on the middle and hind legs. Long, sharp spines, which are more or less regularly arranged in rows running the length of the segment, occur on the tarsal segments, particularly on those of female specimens. Besides these spines there are heavy, long, articulated spurs on each leg. These will be considered later in connection with the segment of the leg to which they are attached.

Each leg (Pl. III, fig. 25) is made up of a rather short *coxa* (Cx), a distinct *trochanter* (tr), a very long ***femur*** (Fe), an elongate *tibia* (Tb), five *tarsal segments* (ta_1, etc.) of varying length and a *praetarsus* (pt) bearing a pair of claws. The coxae are robust and rounded. In the fore legs each coxa has a single antero-lateral articular surface which is moulded to receive the coxal process of the propleurum. The coxae of the middle and hind legs each moves on a similar articulatory apparatus which consists of an inner articular surface and coxal process. A pair of laterally placed, tubercle-like condyles are found near the distal portion of each coxa projecting inward from the walls. These condyles, together with the peculiarly shaped base of the trochanter, make up the articulation between the coxa and the trochanter. The femora are long, somewhat cylindrical segments which articulate with the tibiae by means of an arrangement similar to that found between the coxa and the trochanter.

The fore tibiae are somewhat enlarged distally. Each fore tibia bears a long, movable spur (Pl. III, fig. 26) at the base of an incision in its inner distal margin and this spur bears a weakly chitinized flap or brush on the surface next to the tibia. The flap, together with the modified inner basal surface of the *basitarsus* (ta_1), forms the so-called *antenna cleaner* (ac). The tibiae of the middle and hind legs each bears, on its inner apical margin, two long, curved, movable spurs which are known as the *tibial spurs* (tbs). Of the five tarsal segments the first, or basitarsus, is much the longer while the second, third and fourth segments are successively shorter. The fifth tarsal segment is about as long as the third and is not cylindrical, for the base is much narrower than the apex and the ventral surface of the segment is flattened. In the female, the tarsal segments of all the legs are, in general, rounded and cylindrical although the fifth, as mentioned above, has a distinctive shape. The tarsal segments of the hind leg of the male are different from those of the other legs in that they are not only proportionately longer, but are strongly compressed laterally. A cross section of one of the segments shows its shape to be triangular. At the apex of each of the first four tarsal segments is to be found a very small, nearly membranous flap which projects from the margin of the ventral surface of the segment. These flaps are called the tarsal pulvilli or euplantulae.

The *praetarsi* (pt) of both sexes are very similar although female specimens have the *tooth* (to) at the base of each claw better developed than it is in the male and more spines are to be found on the *orbicula* (or). In general, the structure of the parts comprising the praetarsus (Pl. III, figs. 27 and 28) is very similar to that described by Snodgrass (1925) for the honeybee.

The *unguitractor* (un) is seen on the ventral surface of the praetarsus as a large, basal plate, the base of which is partially hidden by the apex of the fifth tarsal segment (ta_5). The *claws* (cl) are large and curved and each bears a small *tooth* (to) near the base of its inner ventral surface as well as two long spines just basad of the tooth. The *planta* (p) is a hairy, pad-like structure and the *camera* (cm) appears as a heavily chitinized girdle. The *arolium* (ar) is membranous and very soft and is bent dorsad between the claws. The *orbicula* (or) is seen on the dorsal surface as a rounded sclerite from the back of which projects a chitinized bar which extends distally to the dorsal prolongations of the girdle-like camera.

Wings.—Lepeletier (1845) described the color of the wings of *P. elegans* as " . . nigro-violaceae, margine postico minus opaco . . " (p. 489). In preserved or old specimens the violet lustre is nearly lost and, when the wing is seen against a light background, a dark brown color is predominant. The tips of the wings are lighter in color and the wing surface is covered throughout with fine, black hairs.

The approximate average size of the wings is as follows:—

Fore Wings	Length	Width at pterostigma
Male	18 mm.	6 mm.
Female	22 mm.	7 mm.
Hind Wings	Length	Width at hamuli
Male	13 mm.	4 mm.
Female	15 mm.	5 mm.

The new system of nomenclature for hymenopterous wing veins and cells as presented by Tillyard (1926) has been used in preference to the Comstock-Needham and other systems as it seems to offer advantages which are not to be found in the others.

Fore Wings.—(Pl. III, figs. 19 and 20.) *Costa* (C) forms the basal portion of the front margin of the wing. It is moderately strong and is considerably thickened at its base. The *principal vein* (Sc+R+M) is the strongest of the wing veins. It is formed by the fusion of Sc, R and M, but *media* (M) is given off much before the middle of the wing as a separate vein and the fused subcosta and radius (Sc+R) continue to the *pterostigma* (pt). *Radius* (R) continues distad of the pterostigma as the marginal vein.

The pterostigma is found slightly beyond the middle of the margin of the fore wing. It is elongate and, except for the veins limiting its area, is not greatly thickened. The first radio-median cross vein is lost, but the second (rm_2) is given off from the distal portion of the pterostigma and reaches the *first branch of media* (M_{1+2}). This cross vein is the radial cross vein of Comstock.

Media is given off from the principal vein before the middle of the wing and, after making an acute turn at the point of junction with the *first medio-cubital cross vein* (mcu_1), proceeds towards the apex of the wing and divides near the middle of the wing into two branches which are called the *first branch of media* (M_{1+2}) and the *second branch of media* (M_{3+4}). The first branch of media meets the second radio-median cross vein and, towards the apex of the wing, curves forward and joins with the radial sector to form the serial vein ($Rs+M_{1+2}$) which limits the third radial cell distally. According to Comstock the basal section of M_{1+2} is the radio-median cross vein while the terminal serial vein is formed by the third branch of radius. The *second branch of media* (M_{3+4}) proceeds towards, but does not attain the outer margin. The two branches of media are joined by the *first* and *second inter-median cross veins* (im_1, im_2) which are, respectively, R_5 and R_4 of Comstock.

The *first branch of cubitus* (Cu_1) follows a zigzag course towards the anal angle of the wing, but the free terminal section does not attain the margin of the wing. The *first medio-cubital cross vein* (mcu_1) serves to connect Cu_1 with media and two other cross veins (mcu_2, mcu_3) connect Cu_1 with the second branch of media. These last-named cross veins are, respectively, the veins M_{3+4} and M_2 of Comstock. Cubitus, as interpreted by Tillyard, is made up of parts of the veins Cu, M_4, M_3, M_2 and m of Comstock. The second branch of cubitus and the anal vein are fused to form a straight vein (Cu_2+A) which does not quite attain the margin of the wing near the *axillary excision* (ax). This vein is the first anal of Comstock. The first inter-cubital cross vein is lost, but the *second* (icu_2) and *third* (icu_3) (which are, according to Comstock, the veins Cu_1 and M_3) serve to connect Cu_1 and Cu_2+A.

The axillary excision is moderately developed and the area immediately surrounding it is considerably thickened. The anal furrow, which should be known as the *inter-cubital furrow* (ic) in order to agree with the terminology used by Tillyard, is well developed and extends from the base of the wing to the axillary excision. It is situated in front of and parallel to the anal vein.

Tillyard changes the names of the various cells of the hymenopterous wing to agree with the changes which have been made in the names of the veins. In general it may be said that the cells are considered to be arranged in six longitudinal (from base to apex of wing) series which are, beginning at the front margin of the wing, the costal and subcostal, radial, median, submedian, cubital and anal series. The homologies of the cells found in the fore wing of *P. elegans* in the Tillyard, Comstock-Needham, and the usual system of other authors are given in the following table which is adapted from Tillyard (1926, p. 258).

Tillyard System		Comstock-Needham Notation	Usual System of Previous Authors
Name	Notation		
Costal+subcostal	$C+Sc$	$C+Sc_1$	Costal
Pterostigma	pt	Pt	Pterostigma
1st+2nd radial	$1R+2R$	$R+1st\ R_1$	1st cubital
3rd radial	3R	$2nd\ R_1+R_2$	Radial
Basimedian	BM	M	Median
1st median	1M	R_5	2nd cubital
2nd median	2M	R_4	3rd cubital
3rd median	3M	R_3	4th cubital
1st submedian	1SM	M_4	1st discoidal
2nd submedian	2SM	1st M_2	3rd discoidal
3rd submedian	3SM	M_1	2nd apical
Basicubital+cubital	$BCu+1Cu$	$Cu+Cu_1$	Submedian
2nd cubital	2Cu	M_3	2nd discoidal
3rd cubital	3Cu	2nd M_2	1st apical
Anal	A	A	Anal

Hind Wings.—(Pl. III, figs. 20 and 21.) The veination of the head wings is found to be greatly modified. C+Sc and R+M are fused for about one-third of the distance from the humeral angle of the wing to the *hamuli* (h), but, at the apex of the fused portion, this composite vein divides into two branches, the anterior of which (C+Sc) forms the front margin of the wing as far as the hamuli where it again joins the posterior branch (R+M). *Media* (M) is given off posteriorly in the region of the hamuli as a separate vein while *radius* (R) continues along the front margin of the wing. Media proceeds towards, but does not attain, the outer margin of the wing. It is, to all appearances, an unbranched vein, but in reality the *first branch of media* (M_{1+2}) is the only portion clearly seen for the basal section of the second branch which usually connects the two brances of media is lost although the remainder of the second branch is present as is discussed below. The single existing *inter-median cross vein* (im) joins the two branches of media near their apices. The obliteration of the basal section of the second branch of media allows this vein to fuse with the medio-cubital cross vein to form the serial vein ($mcu+M_{3+4}$) which joins the *first branch of cubitus* (Cu_1) basally and, as mentioned above, is joined near its apex to the first branch of media by the first inter-median cross vein. The first branch of cubitus is a well developed vein which curves posteriorly until it nearly attains the margin of the wing in the region of the anal angle. It is joined near its tip to the serial vein ($Cu_2+A+icu$) composed of the second branch of cubitus, the anal vein, and the inter-cubital cross vein.

The medial furrow, which should be known as the *inter-median furrow* (imf) in order to agree with the nomenclature of the region in which it occurs, is well developed and extends as a distinct line from the base of the wing nearly to the inter-median cross vein (im). The *inter-cubital furrow* (ic) of the hind wings (usually known as the anal furrow) is also well developed and extends from the base of the wing nearly to the anal margin and crosses the vein $Cu_2+A+icu$ at a point over half the distance from the base to the apex of the vein. The axillary furrow or second anal furrow forms the anterior margin of the anal lobe.

It is difficult to discern the homologies of the various cells of the hind wing because of the modifications which are found in the veination of the wing. Plate III, figure 22 shows the names which have been given to the cells in the Tillyard system and the following table gives the homologies as they have been worked out in the Tillyard, Comstock-Needham and the usual system of previous authors.

Tillyard System		Comstock-Needham	Usual System of
Name	Notation	Notation	Previous Authors
Costal+subcostal	$C+Sc$	$C+Sc+Sc_1$	Costal
Radial	R	R_1+R_2	Radial
Basimedian+median	$BM+M$	M	Median
2nd median	$2M$	$R+R_{3+4+5}$	Cubital
Submedian	SM	M_4+1st M_2+M_1	Apical
Basicubital+cubital	$BCu+Cu$	2nd $M_2+M_3+Cu+Cu_1$	Submedian
Anal+2nd cubital	$A+2Cu$		Anal

Articulation of the wings.—Several articulatory sclerites occur at the base of each wing. Plate III, figures 23 and 24 show the most important of these, figure 23 indicating the arrangement to be found in the front wing and figure 24 that occurring in the hind wing. Crampton (1927 and 1928) has studied the wing bases of several insects and has applied names to the various sclerites found there. His nomenclature is used in this paper in preference to that used by Snodgrass (1927) although the nomenclature used by Snodgrass is included in the following descriptions.

Fore wing.—When the fore wing is extended and the base is flattened so as to show all the parts, a small sclerite is found near the anterior margin of the wing just beneath the tegula. When the base of the wing is not flattened the sclerite is visible on the ventral front margin, but, when the base is flattened out, the sclerite twists around so as to appear as a dorsal sclerite or ossicle which is known as the *basalar sclerite* (ba) and is joined at its base to the anterior portion of the dorsal margin of the mesopleurum. The distal portion articulates with the ventral basal margin of the *parategula* (ptg) which is situated basad of the proximal portion of the fused costal and the subcostal veins (C+Sc). The *notale* (n), which Snodgrass calls the first axillary sclerite, articulates distally with the parategula and is prolonged at its base to articulate with a portion of the lateral margin of the tergum. The notale lies dorsad of and hides the greater portion of the *first mediale* (ml_1) which is the second axillary sclerite of Snodgrass. The *second mediale* (ml_2) or median plate lies distad of the first mediale and between the bases of the veins Sc+R+M and Cu_2+1A. It is an oval sclerite. The *basanale* (bas) or third axillary sclerite is seen on the dorsal surface as a long and thin chitinized plate. Below the surface of the membrane surrounding the sclerite, however, it flares out on each side making the plate somewhat broader than is apparent on the surface. Basad of the basanale is the *adanale* (ad) which is made up of three separate sclerites comprising the fourth axillary of Snodgrass and the so-called muscle bearing sclerite associated with it.

In the hind wing the *basalar sclerite* (ba) is present, but distally it articulates directly with the enlarged base of the fused veins C+Sc+R+M instead of with the parategula as is the case in the fore wings. The *notale* (n) is distinct, but does not cover the *first mediale* (ml_1) as in the fore wings. The *second mediale* (ml_2) is present between the bases of veins Cu_1 and Cu_2+Al+icu, while the *basanale* (bas) is approximately the same as in the fore wings. Apparently there is no adanale in the hind wings, the basanale articulating directly with the posterior lateral margin of the metanotum. There is a rather heavy deposition of chitin (al) at the base of the anal lobe in the hind wing, but this is evidently merely a secondary modification.

ABDOMEN

Propodeum.—(Pl. II, fig. 11, Pro.) The propodeum (known also as the median segment and erroneously as the metanotum), which is morphologically the tergite of the first abdominal segment the sternite of which has been lost, appears at first sight to be a very large, posterior and dorsal sclerite of the thorax. It extends posteriorly from the metapostscutellum (Ms), to which it is rather closely attached, to the abdomen proper. Its hind margin forms the dorsal plate surrounding the aperture for the attachment of the abdomen. It is bordered by the metapleura (Pl) on its latero-ventral margins and a pair of *spiracles* (ps) occur near the anterior margin of the sclerite. The surface of the propodeum bears numerous features of systematic importance in the form of sculpturing, depressions and protuberances. These, however, seem to have no morphological significance, merely being modifications of the single propodeal sclerite.

The dorsal surface of the propodeum is divided into two distinct parts. These are the so-called *horizontal surface* (hs) or upper surface, which is the anterior, nearly horizontal portion and the *sloping surface* (ss) or posterior surface. The lateral margins of the horizontal surface are formed by the lateral carinae to be described later. The horizontal surface has a rather broad, median, longitudinal raised area which begins at the front margin of the propodeum and ends in a low *transverse ridge* (td) (also known as the median transverse fold or as the median hump) at the junction of the horizontal and sloping surfaces. A very shallow, longitudinal median furrow is to be found running the length of the median raised area. This furrow is more conspicuous in the female than in the male. The median raised area is crossed by regularly placed, transverse striations which become indistinct in the depressions between the raised area and the low, longitudinal *lateral carinae* (ll) one of which occurs on each lateral margin of the horizontal surface. The transverse striations become distinct again on the lateral carinae and extend more or less irregularly downward across the sides of the propodeum. Each lateral carina starts just behind and dorsad of the spiracle as a low elevation which becomes more pronounced posteriorly and ends at or just behind the line of division of the two main surfaces of the propodeum as a *lateral tooth* (lt) or tubercle, the apex of which is crossed by a few short transverse striations. Just ventrad of the spiracle is found a low, broad, elevated area which is known as the subspiracular tubercle. This elevation is not distinct in *P. elegans*.

The sloping surface is flat behind the transverse ridge and falls away laterally to the line of fusion of the metathoracic pleura with the propodeum. The sloping surface has but a few, weak, transverse striations near its anterior margin. The hind margin of the propodeum is thickened and forms a narrow, shelf-like ledge which is projected laterally to form a rounded lateral angle on each side. The posterior surface of the thickened marginal ledge (Pl. II, fig. 13) is excavated in the middle of its ventral margin and has two *arms* (aa) which project into the excavation and form points of attachment for the funicle of the abdomen.

Abdominal segments.—(Pl. IV, fig. 29.) Correct morphological diagnosis would show the propodeum to be the tergite of the first segment of the abdomen, the sternite of the first segment having been lost. The propodeum, however, being more closely joined to the thorax than to the other segments of the abdomen, is usually described with the thorax and the segment directly behind the propodeum is usually counted as the first segment of the abdomen. It is so considered in this paper and the segments following the constriction are numbered consecutively from front to rear, that directly behind the constriction being called the first abdominal segment.

When seen from above the abdomen is somewhat elongately ovate in outline, its shape being dependent on the degree of distention. The abdomen is flattened on its ventral surface and the outline of its dorsal surface, when seen from the side (except for that part of the outline formed by the tergite of the first segment), is a nearly regular arc. The entire surface is covered with a short, thick, purplish pubescence. Longer hairs are scattered irregularly over the apical dorsal and ventral plates of the female while, in the male, there is a well-formed hair tuft on the fourth sternite and scattered long hairs are to be found on the posterior segments, subgenital plate and cochleara. The hair tuft on the fourth sternite is a character of specific value. It occurs in the middle of the anterior portion of the sternite and is composed of long black hairs arranged transversely in a thin line forming an arc across the sternite. The outer hairs are the longer and have their tips curved abruptly inward while the hairs themselves are bent over so as to be directed caudad. They are less erect than the shorter ones which occur nearer the median line of the body. Directly behind the hair tuft on the fourth sternite is a somewhat depressed, half-moon shaped, glabrous and shiny area. The fifth and sixth sternites each has a smaller median glabrous area, that of the fifth being depressed, that of the sixth being much smaller and slightly elevated along its longitudinal axis.

The connection between the abdomen and propodeum (Pl. II, fig. 13) is made by the insertion of the small basal portions of the tergite and sternite of the first segment into an aperture which is bounded dorsally by the hind margin of the propodeum (Pro), laterally by the coxae of the metathoracic segment (Cx_3) and ventrally by the metafurcisternum (fs_3). The tergite of the first segment bears, near its base, a pear-shaped aperture with a raised rim from which extends a ligament-like band known as the funicle. This band is attached to arms (aa) projecting into the excavation in the hind margin of the propodeum.

The first tergite is abruptly swollen or enlarged posteriorly (less suddenly in the male than in the female) and the maximum width and thickness of the abdomen is reached near the middle of the second segment. There are six *tergites* (1T, 2T, etc.) visible in the female and seven in the male, the second being the broadest. Six *sternites* (1St, 2St, etc.) are to be seen in both sexes although a small seventh (as will be discussed later) is sometimes visible in the male insect. On each visible tergite and on the seventh of the female, which is hidden under the sixth, is found a pair of *spiracles* (sp), one near each antero-lateral margin of the tergite. The second sternite bears a distinct and deep, somewhat sinuate, *ventral furrow* (vf), the lateral extremities of which are curved and projected posteriorly. This furrow, which is a character of generic value, is less distinct in male than in female specimens.

The sixth tergite is the last one visible in the female. It completely covers the small, narrow seventh which lies just over the structures composing the sting and which is connected with the sting mechanism and the sixth tergite by membrane. The sixth sternite carries two lobes near its apex which bend upward and around the protruding *sheath* (sh), *lancets* (not visible in fig. 29) and *palpi* (pp) of the sting, thus forming a cone-shaped covering having an opening at its apex through which the sting can operate. The eighth sternite is not to be found as a separate segmental plate and probably enters into the composition of the basal portion of the sting.

Modifications occur in the sclerites forming the terminal abdominal segments of the male (Pl. IV, figs. 31-33). The seventh tergite (7T) is clearly visible as a dorsal sclerite. The eighth tergite (8T), which is known as the *epiproct,* is hidden under the seventh. It is divided into two lateral, heavily chitinized portions connected by membrane. There is a hairy, one-segmented, palpus-like structure borne at each outer, lateral angle of the tergite which Saunders (1884) termed a *penicillium* (pe). The sixth sternite (6St) usually appears to be the last ventral sclerite (exclusive of the *subgenital plate* (SP)), but the seventh sternite (7St) is present and hidden although it sometimes shows if the abdomen is distended. There is a deep, broadly rounded incision in the middle of the hind margin of the sixth sternite and, on each side just laterad of the mouth of the incision, is found a small, hook-like protuberance which arises abruptly from the surface of the plate. It is not a separate structure, but part of the sternite and its functions are not known. The seventh sternite (7St) is of a half-moon shape and lies just below and in front of the *subgenital plate* (SP) or *hypandrium* which was considered by Saunders (1884) to be the basal portion of the *true* ninth sternite (eighth sternite according to the system of nomenclature used in this paper). The subgenital plate is elongate, being about three times as long as wide at its widest part. Its lateral margins are concavely arcuate and the apical, lateral angles are rounded. The ventral surface of the plate is elevated at its base to form a low, longitudinal carina. The apical portion of the ventral surface of the subgenital plate is covered with short and stiff black hairs.

Endoskeleton of the abdomen.—The abdomen has no distinct endoskeleton of the type found in the thorax. The chitinized portions of the sting and genitalia, although internal in position, are considered to be highly modified tergites, sternites and terminal appendages of the abdomen so that they cannot be classed as true endoskeletal structures. The inner surfaces of most of the tergites and sternites are much the same in appearance, so that figures 35 and 36, which are views of the inner surfaces of the tergite and sternite of the second abdominal segment of the female, can be considered as typical.

The tergite (Fig. 36) is seen as a broad, quadrate plate which extends over the dorsal and lateral surfaces of the segment. The anterior margin of the plate is inserted under the hind margin of the tergite of the preceeding segment and is connected to it by membrane which is attached to the preceeding tergite some distance cephalad of its posterior margin. (Attachment of third tergite to second is shown in figure 36 by the broken line near the posterior margin.) The anterior margin of the tergite is raised so that a thickened rim is formed which extends to the pointed anterior lateral angles. The spiracles, as mentioned before, are placed near the antero-lateral margins of the tergite.

The sternite of the second abdominal segment is also a quadrate plate which covers the ventral surface and a portion of the lower lateral surfaces of the segment. Its anterior margin is inserted above the hind margin of the sternite of the preceding segment and the front margin is thickened by a transverse rim which extends to the pointed anterior lateral angles of the sternite. The lateral margins of the sternite are inserted under the lateral margins of the tergite of the same segment. The ventral furrow (vf), which is present only on the sternite of the second segment, is seen on the ental surface as a raised area, the outlines of which follow those of the furrow as it is observed on the ectal surface of the sternite.

Sting.—(Pl. IV, fig. 30.) The sting is, with the exception of a few modifications in the structure of its component parts, very much like that of the honeybee as described by Snodgrass (1925) whose nomenclature for the various parts is used in this paper. The sting proper consists of three parts; a dorsal ***sheath*** (sh) and two ventral *lancets* (lct) which slide in a groove on the under surface of the sheath. The sheath is long, pointed, and heavily chitinized. It has a relatively smooth surface distally and lacks the barbs which are found on it in the honeybee. It is enlarged basally to form a *bulb* (sb) which has, connected to it by two lateral articulations, an upward-crooked, heavily chitinized *basal plate* (bp). In addition the sheath is prolonged anteriorly to form two curved lateral *arms* (sha). Each arm is flattened near the bulb to allow the lancets to slide over its dorsal surface. The arm then extends anteriorly as a long, thin and curved, chitinous plate which is mesad of the lancet and which joins a less heavily chitinized prolongation of the *oblong plate* (ob). The lancets extend along the ventral groove of the sheath as long, thin, hair-like structures. Each is attached at its base to a so-called *triangular plate* (tp) which is articulated at its base with the *quadrate plate* (qp) and the oblong plate. The oblong plate extends over and covers the basal plate and bulb of the sheath and is joined dorsally to the oblong plate of the other side of the sting structure by a heavily chitinized narrow band. It bears a so-called *palpus* (pp), which consists of two distinct segments, near its dorsal surface. The quadrate plate articulates at its base with the triangular plate and extends over and partially covers the oblong plate. It is joined dorsally to the quadrate plate of the other side by a chitinized band. A peltate *dorsal plate* (dp), the homologies of which have not been determined, occurs on the dorsal surface between the chitinous bands connecting the two quadrate plates and the two oblong plates.

Genitalia.—(Pl. IV, fig. 34.) The genitalia or copulatory apparatus of the male lies dorsad of the subgenital plate or hypandrium and ventrad of the eighth tergite or epiproct, but it is inserted between these two plates to such an extent that the distal portions of the *cochleara* (cc) are usually the only parts visible (Pl. IV, fig. 31). Boulangé (1924) has collected the material written concerning the genitalia of Hymenoptera in his paper "Recherches sur L'Appareil Copulateur des Hymenopteres et especialment des Chalastogastres" while Radozskowski (1888) gave names to the various parts of the genitalia of Psammocharidae.

The basal ring of the genitalia is a simple ring or chitinous band which, as its name indicates, is basad of the remainder of the genitalia and extends around and covers the bases of the gonostipites (gst). When seen in dorsal aspect each gonostipes appears as a heavily chitinized, somewhat triangular plate which is prolonged at its inner, distal angle to form a long, flat, ribbon-like structure which I would term the *distal prolongation* (id) of the gonostipes. The *cochlearum* (cc) or "branche" of Radozskowski is articulated at the outer corner of the gonostipes. A ventral view of a gonostipes shows it to have a very irregularly triangular outline which is cut into by a deep excavation in the inner(mesal) margin near the base. The ventral surface of the *gonostipes* terminates distally in a blunt point, to the dorsal margin of which is attached the *sagitta* (sag) or volsella. The ventral, inner(mesal) margin of the gonostipes is bent dorsad and forms a flange which bears two small teeth on its inner edge and the ventral, outer or lateral margin is moulded to form an articulation with the base of the cochlearum. Each gonostipes is rounded laterally and the pair, taken together, make up a hollow, shell-like structure which partially encloses the *aedeagus* (ae).

The *cochlearum* (cc) is elongate; its dorsal surface is convex; its ventral surface is flattened. Towards the apex of the cochlearum the inner surface is somewhat flattened and the apical inner, dorsal and lateral surfaces bear long, dark, spine-like hairs. The *sagitta* (sag) is joined to the gonostipes by membrane, its base being placed between the distal, blunt point of the ventral surface and the distal prolongation of the dorsal surface. A small, sharp-pointed tooth or protuberance is found on the inner margin of the sagitta near its base. The sagitta is enlarged apically to form a spoon-like structure, the inner edge of which is prolonged to form a pointed, beak-like structure which gives the enlargement the general outline of a bird's head although it may be said to be spoon-like in that the ventral surface is convex while its dorsal surface is concave. The penis valves, which, together with the penis are called the *aedeagus* (ae) form a single, rather weakly chitinized structure which lies between the gonostipites.

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ABBREVIATIONS

(Not including Figs. 19 to 24, inc.)

a	Antennal socket
aa	Arms for attachment of funicle
ac	Antenna cleaner
ae	Aedeagus
ah	Anterior articulation of mandible
an	Antennifer
ar	Arolium
at	Anterior arms of tentorium
bp	Basal plate of sheath
bt	Body of tentorium
C	Clypeus
ca	Cardo
cc	Cochlearum
cm	Camera
cl	Tarsal claw
cp_1, cp_2, cp_3	Coxal processes
Cx_1, Cx_2, Cx_3	Coxae
dp	Dorsal plate of sting
dt	Dorsal arms of tentorium
E	Compound eye
Ep	Epicranium
Epm	Mesepimeron
Eps_2	Mesepisternum
es	Epicranial suture
ex	Base of extensor muscle of mandible
f	Frons
fc	Fronto-clypeal suture
Fe	Femur
fl	Flagellum
fo	Foramen
fp	Furcal pit
fs_1, fs_2, fs_3	Furcisterna
fx	Base of flexor muscle of mandible
G	Gena
ga	Galea
gb	Pregula
gl	Glossa
gs	Gular suture
gst	Gonostipes
hs	Horizontal surface of propodeum
hyp	Hypopharynx
id	Distal prolongation of gonostipes
il	Interlorum
L	Laterocervical
la	Labrum
lc	Lacinium
lct	Lancets
ll	Lateral carina of propodeum
lp	Labial palpus
lt	Lateral tooth of propodeum
Md	Mandible
mn	Mentum
mpg	Median episternal groove

Ms	Metapostscutellum
mt	Mesopleural tubercle
mxp	Maxillary palpus
N_3	Metanotum
o	Ocelli
ob	Oblong plate of sting
oc	Occiput
op	Occipital process
or	Orbicula
os	Occipital suture
p	Planta
pa	Posterior arms of tentorium
pd	Pedicel
pe	Penicillium
pf	Parapsidal furrow
Pg	Postgena
pgl	Paraglossa
ph	Posterior articulation of mandible
phg_1	Prephragma of mesotergum
phg_2	Postphragma of mesotergum
Pl	Metapleurum
Pn	Pronotum
pm_2	Mesopostscutellum
pp	Palpus of sting
Pr	Prescutum
Pro	Propodeum
ps	Propodeal spiracle
Psc	Parascutellum
pt	Praetarsus
qp	Quadrate plate of sting
S_1, S_2, S_3	Sterna
sa_1, sa_2, sa_3	Sternal apophyses
sag	Sagitta
sb	Bulb of sheath
sca	Scape of antenna
Scl	Scutellum
Sct	Scutum
sh	Sheath of sting
si	Metathoracic spiracle
sm	Submentum
SP	Subgenital plate
sp	Spiracles of abdomen
ss	Sloping surface of propodeum
1St, 2St, etc.	Sternites of abdomen
sti_1, sti_2	Stipes of maxilla
1T, 2T, etc.	Tergites of abdomen
t	Tooth of mandible
ta_1, ta_2, etc.	Tarsal segments
Tb	Tibia
tbs	Tibial spurs
tc	Trophicava
td	Transverse ridge
tg	Tegula
to	Tooth of tarsal claw
tp	Triangular plate of sting
tr	Trochanter
ts	Tarsal spur
un	Unguitractor
v	Vertex
vf	Ventral furrow
vnr	Ventral V-shaped ridge of notum

SCLERITES, ETC.
(Figs. 22 to 24, inclusive)

ad	Adanale
al	Chitinous base of anal lobe
ax	Axillary excision
ba	Basalar sclerite
bas	Basanale
h	Hamuli
ic	Intercubital fold
imf	Intermedian fold
ml_1, ml_2	Medialia
n	Notale
pt	Pterostigma
ptg	Parategula

VEINS

(Figs. 19 to 21, inclusive)

C	Costa
Sc	Subcosta
R	Radius
Rs	Radial sector
M	Media
M_{1+2}	1st branch of media
M_{3+4}	2nd branch of media
Cu_1	1st branch of cubitus
Cu_2	2nd branch of cubitus
A	Anal
icu, icu$_2$, etc.	Intercubital cross veins
im, im$_1$, etc.	Intermedian cross veins
mcu, mcu$_1$, etc.	Mediocubital cross veins
rm$_2$	2nd radiomedian cross vein

CELLS

See pages 138 and 140 of text.

EXPLANATIONS OF PLATES

PLATE VI

Fig. 1.—Head, frontal aspect.
Fig. 2.—Head, caudal aspect.
Fig. 3.—Tentorium of head. (Vertical section along longitudinal axis.)
Fig. 4.—Lateral view of right mandible.
Fig. 5.—Caudal aspect of right maxilla.
Fig. 6.—Detail of maxillary structures in region of interlorum.
Fig. 7.—Detail of structures near apex of hypopharynx.
Fig. 8.—Antenna of female.
Fig. 9.—Antenna of male.
Fig. 10.—Segment of flagellum of male antenna showing sensory areas.

PLATE VII

Fig. 11.—Thorax, lateral aspect.
Fig. 12.—Thorax, ventral aspect.
Fig. 13.—Structure of thorax at point of attachment of abdomen.
Fig. 14.—Lateral view of internal structures of thorax.
Fig. 15.—Lateral aspect of mesotergum and phragmas.
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Fig. 17.—Dorsal aspect of mesothoracic endoskeleton.
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PLATE VIII

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Fig. 20.—Cells of fore wing.
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Fig. 22.—Cells of hind wing.
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PLATE IX

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THE LAST MEADOW KATYDID; A STUDY OF ITS MUSICAL REACTIONS TO LIGHT AND TEMPERATURE

(ORTHOPTERA: TETTIGONIIDAE)

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During the autumn of 1927 the delay of severely cold winter weather until December (in the Washington region) was reflected in the number of surviving Meadow Katydids, mainly of the species *Orchelimum agile* DeGeer, singing throughout November. Even though frosts and temperatures below 32°F were experienced on several days as on November 7, 14, 19, 20 and 21, days and evenings of unseasonable warmth were occasionally experienced. More than once I had concluded the Meadow Katydids had been at last silenced after a keen frost for not a sound was heard. The next warm spell, however, sending the temperatures near or above 70° stimulated them to singing again. This seasonal condition continued throughout November, with the temperatures in the evening between 5 and 6 P. M. warm enough to stimulate the Meadow Katydids to sing on the following days so far as my own recorded observations go: November 15, 24, 29, 30 and December 1.

The Meadow Grasshoppers are naturally day-singers. They are creatures of dry heat and blazing sunlight and during the hot August days prefer the upper portions of the weed-zone such as the Ragweeds, the Asters and Golden rods. Their most active period of singing is around mid-afternoon until sunset, when their songs then take on a more leisurely delivery characteristic of the night-song. Unlike many of the ground crickets *Nemobius,* in fact unlike even the Snowy Tree Cricket *Oecanthus niveus,* the Orchelimums have a much higher optimum for singing, and temperatures above 70° are most to their liking. There were a number of days in November when the temperature around sunset approached 65 to 70°F, and it was on these evenings that the wing-music of the lone survivors was not infrequently heard as well as during the heat of the day. Otherwise they were musical only during the sunnier hours of the day when temperatures were high enough to stimulate their musical inclinations into expression.

On November 30 the weather was warm enough to stimulate a lonely little Meadow Katydid *Orchelimum agile* to sing briskly in the weeds across the road. It seemed to be about the last of its race in the vicinity, for there was a noticeable dropping off in numbers as attested by their "singing", with each cold spell.

Wishing to make a careful study of this lonely little Katydid I captured him after some difficulty, and placed him in a clean one quart glass jar with some dead grass and leafage at the bottom, confining him here by tieing a piece of thin muslin over the top. This little katydid at once responded to the warmth of the room with his moods of song, and he became a pet with every one around, his eternal singing ever reminding one of the hot summertime. To say the least one's spiritual moods were touched with his dreams and lisping reminders of hot August days and he became an organic entity, a friend, a poet in our midst, a living presence for three months with a cosmic message in the music of his restless wings.

His food was a simple matter, for they are vegetarians and he was as fond of fresh green lettuce as any human. From time to time I supplied him with a good sized piece of fresh crisp leaf, so that it would not wither too quickly, wetting it usually before putting it into his cage. As soon as it became soiled or too much wilted I removed it. Lettuce became his chief article of diet, although I offered him other raw vegetable foods to learn something of his likes and dislikes, and his behavior reactions. Bits of onion offered to him were always consistently refused without touching. To him it was something to be rigidly excluded from his bill of fare and some keen sense of smell appeared to be in operation. From the first he was very fond of banana, and he was as inordinately fond of grains of granulated sugar as a child for candy. I had only to moisten the end of a broom-straw, pick up a few adhering sugar-grains and offer them to him. He would seize them or the broom-straw itself as ravenously as a hungry cat snatches at a piece of fish or meat, oftentimes holding them in his front feet like a squirrel, licking and chewing upon them making distinctly audible clicks with his powerful mandibles. All the while he continued to sing in a mood of evident contentment, apparently getting as much out of life as I while he hummed softly to himself.

The little creature's singing habits were of especial interest to me, for the moods and motives of all singing creatures interest me. The singing moods of my little captured Orchelimum showed distinctive responses to the night and the day, to sunlight and to the weaker artificial light. His most energetic and typical singing was a mood for the mid-day sun alone, when his fervor reached its maximum. As soon as darkness came on, even though temperature between 70 and 80°F were afforded him, his singing became less insistent, less vehement, and took on a more dreamy, droning character. These day and night responses were never departed from to any marked extent while he lived. Even though the artificial light of the room was weak in comparison with sunlight, he continued to sing feebly, and oftentimes appeared to sing very sluggishly in the darkness most of the night after all had retired. If he was silent, however, the moment I turned on a light his friendly monotone usually greeted me almost instantly. To his eyes the brightest artificial light appeared to be as weak light, and transferring him at once to a blaze of sunlight at the same temperature caused him to tune up to his highest in a short time.

The typical song of this Orchelimum is a combination of two distinct elements, a preceding number of staccato lisps zip-zip-zip, followed by a lisping monotone of eight or ten seconds' duration. This is the typical singing habit of most of our Meadow Katydids *Orchelimum*, except the Pine Meadow Katydid *Orchelimum minor*, which omits all preceding staccato lisps.

A study of my little katydid under controlled conditions revealed rather interesting temperature responses. These two elements of its song are not affected in the same way. In the regular rhythmic chirping of the Snowy Tree Crickets *Oecanthus niveus,* there is a marvellously regular slowing down with departures from the optimum for singing, revealing a nice correlation curve with lowering temperatures. As a matter of fact there is no other evident change that can take place in its song. So nice is the correlation, however, for any particular cricket or perchance a group or race of crickets, that these have been termed thermometer-crickets, and formulae have been devised to determine the air temperature by determining their rates of chirping per minute.

We may now consider the more evident changes which took place in my little Meadow Katydid's song. We will first consider its typical song at optimum conditions of temperature ranging between 75 and 80°F or above. The response may be studied under two sets of conditions, in the one allowing the temperatures to vary with optimum conditions of sunlight obtaining; in the other with artificial lighting obtaining. A standard thermometer used in laboratory experimental work was passed through the center of the thin muslin screen enclosing the top of the jar and held rigidly in position by a pasteboard framework, the bulb being kept near the center of the jar just above the debris near the katydid. This arrangement allowed a careful study of its responses to temperature conditions. The entire jar could then be placed in the cold out-of-door temperatures in the full sunlight. This was done only a few times and any severe chilling was avoided, for the longevity of the katydid interested me and I did not wish to hasten its death by any unfavorable treatment. Tests revealed that the insect was exceedingly sensitive to temperature changes, and a very small change sufficed to silence it entirely. The lower temperature limits around which the singing impulse finds weak expression or fails entirely is 58 to 60°F. At 64°F his singing was weak and faint, quite unlike the brisk delivery of his phrases at temperatures of 75° or more. On several occasions when the little katydid was chilled from a temperature of 86°F to 68°F, he ceased singing but each time seemed ravenously hungry and began eating upon his lettuce leaf. Whether or not this was anything more than a coincidence is not known.

In other tests the effect of the normal lowering of the temperature of the room after the furnace was shut up for the night was noted in the much weaker artificial light of the room. Placing the jar near the radiator with temperature around 75-80 which is near the optimum for vehement singing, the two elements of the song are nearly balanced in duration, the staccato lisps requiring about 8-10 seconds, and the succeeding monotone perhaps a little less. Furthermore the number of staccato lisps zip-zip-zip under these conditions of more rhythmic balancing ranges around a mean of 35 to 37°. As the temperatures fall below the optimum of 75 to 80° there is a gradual reduction in the number of staccato lisps which are reduced to only 12-15 around 64-65°. In other words this element of its song does not tend to vary greatly in duration, but the monotone undergoes a marked change in the direction of greatly increased duration. Under extreme conditions barely favorable to the singing impulse, the staccato lisps may cease entirely, and the monotone becomes greatly prolonged continuing even as long as twenty to thirty seconds in some instances. This is an interesting correlation and shows the complexity of the singing or stridulating impulse in some insects.

The typical character of the Orchelimum song with these changes induced is quite lost, and one is reminded of the long irregular lisping notes of some species of Shield-bearer *Atlanticus*. A remarkable feature of this katydid's song, and I doubt not it would be found more or less a regular behavior of normal individuals, is the definite number of staccato lisps oftentimes delivered at a certain temperature level. While departures are introduced, yet the regularity is oftentimes so apparent as to indicate something of the nature of a careful counting before the monotone sets in. Careful experimentation would probably reveal very close means for the various levels of temperature up to the optimum where the maximum number of staccato lisps is found. This does not indicate counting ability on the part of the little katydid but some nice adjustment of the psysiological mechanism to temperature it would seem, so that about so many lisps are delivered within a given time. Back of it all there are probably elements of racial history, heredity, rhythmic appreciation, etc., which make the meaning of it all a complicated matter forever beyond the mind of man to unravel satisfactorily. In bright sunlight at optimum temperatures the number of complete songs per minute averaged around 6-8. Placing the jar in a dark corner of the room with the temperature unchanged, the number of deliveries was reduced to two or three, and singing finally ceased. This was repeated several times with the same results. Throughout the life of this katydid, it was evident that its singing moods were conditioned by light quite as much as by temperature. In the weaker light by which we read at night its singing even at the same temperatures never reached those levels of vehemence characteristic of its deliveries in strong sunlight. The light responses of the katydid were responses of a more sentient creature measured in terms of sound-making whereas the responses of a green plant to various levels of light intensely ranging from strong sunlight to weak artificial light are measured in terms of greenness of coloration and vigor of growth. The katydid expresses the levels of its moods with song; the plant with robustness of growth, and it is probable the analogy is more real than apparent.

To say the least the musical impulses of the singing insects represents a marvellously fundamental feature of their lives. It is one of those deep-seated impulses of life as necessary to many of them as eating or finding sexual expression. The insects themselves are not consciously doing a thing about it, but are born and trained music-boxes automatically wound up by some weird internal mood of life baffling to humans. Each is born with his characteristic mood and mode of singing, yet modification and development eternally proceeds in these racial expressions affecting the mood of the insects just as trends are shown in plus or minus degrees with every morphological feature of the body. No one knows the riddle of it all, for this would be knowing the riddle of life itself. There is reason to believe that environment is in some manner working with the forces of heredity to produce slow yet appreciable changes, just as it is now known that marked changes in the shape of head of Englishman is rather rapidly taking place in England in response to causes not yet definitely known, but thought to be largely of environmental origin.

It may be said that some Meadow Katydids as the Pine Meadow Katydid produces only brief lisping phases, with all staccato lisps omitted. The Agile Meadow Katydid of the present discussion approaches this behavior when light and temperature conditions are not at their optimum. Oftentimes at night my captive katydid delivered several succeeding lisping monotones before an interval of staccato lisps was introduced. Such a behavior is never observed at high temperatures in full sunlight. However, even this seemingly anomalous behavior is a regular method of singing for some species of the smaller Meadow Katydids *Conocephalus*. In their singing habits and in their general morphological makeup, these two genera, of Meadow Katydids *Conocephalus* and *Orchelimum* indicate somewhere close relationships. In their singing habits, neither group shows very much in common with the Cone-heads *Neoconcephalus*.

My little captive katydid appeared so vigorous for two months that I had hopes he would survive until another summer, but I was keenly disappointed. By careful protection each night to see that he experienced no very low temperatures, he survived the winter months (December and January) in a vigorous singing mood. As February advanced, however, I began to sense an almost imperceptible change in his mood and behavior. Very, very gradually his singing became less sustained and energetic. Days came with no music from him. Then a new outburst of song greeted me. It was increasingly evident, however, that the little musician was aging, becoming more sluggish, less inclined to express himself in terms of sound. He ate less voraciously as the days wore on, and by the last week of February there were increasing evidences of senility. One unmistakable sign of his approaching death, to be noted in nearly all creatures, was his tendency to avoid the highest points of his cage and to be inclined to seek seclusion within the leaf debris below. I have noted this behavior so often in cats and other animals, that this new behavior of the little katydid spoke louder than words. A week before he died he showed practically no inclination to sing. even when placed in the warm sun he sang very weakly, as if a languor had seized upon him, and his monotones were irregular and much broken as if muscular control of his wings was gradually being lost. The night of February 29 he persisted in crawling beneath some dead leafage, he seemed weak, he refused to eat, and I knew the end was near. The next morning I found the little katydid on his side inert and apparently dead, for not a movement could be gotten from a tarsal joint, a leg or even his antennae so eternally restless and sensitive in life.

With a magnifying glass I examined him very carefully, and was surprised to find his palpi still very sensitive and mobile, responsive to the touch, etc., but no other movement of his body could be stimulated. A few hours later even the sensitive palpi were quiescent in death, a death and dissolution that comes to all creatures as the functioning of some inexorable cosmic law of nature in her play with life that defies the puerile logic of men.

The death of this little pet katydid deeply affected me, but its life added some new elements of experience to my life and its eternally mobilizing philosophy. I had made a keenly scrutinizing study of its life as it was expressed before me for three long months. It became my pet November 30; it died March first having lived just 91 days in its little cage apparently a happy and contented katydid. Surely it was the last adult katydid of its kind in the region. Its fortunate sojourn with me had made it perhaps the only katydid of its race to project its life into the new springtime. While there may have been an unusual longevity here, I am more inclined to believe it was a comparatively young and vigorous insect when I caught it, and that I was simply the means of allowing it to attain its normal three score years and ten so to speak. Old age appears to be an essential climax of livingness whatever the creature. We seem oftentimes inclined in our philosophies to look upon it as an accidental, an unnecessary condition of life, even hoping sometime to find a panacea, a preventative treatment for our terrorizing senilities. I have as much doubt in this matter as I have about many other things in science that smack of narrow ultra-reasoning. In truth I think there is more reason to believe our best efforts are but futile dreams, amounting only to a trifling delay. To my mind it is reasonable to believe there is an innate temporal stability-condition back of the chemistries of life itself which may account for the inevitable declines of life leading to the final dissolutions of death. We talk glibly of glandular controls, etc., and we fool ourselves with steinach operations and the like, with no sound basis for much faith in such practice, as age seems to be a gradual decline in the entire organic complex, a break down of the entire synthesis of life regardless of its sexual functions. It is well known that a piece of paper or glass or iron, lead. tin or radium or what not of inorganic nature ages as well as things which are endowed with the frailties of life. Atomic and molecular shiftings changing the properties of such apparently stable bodies are also of the nature of aging, so why should the scientist suddenly talk so hopefully of prolonging life to spectacular proportions with all its inherent complexities and instabilities baffling analysis and understanding by his local methods of rejuvenation. I am as ready to believe his aimless hit-or-miss doings may as often hurry along the natural processes of dissolution by his gland grafts, etc., as to prolong life. At best often it is but a localized prodding along of an old machine that has begun to disintegrate in all its parts and assume new atomic and molecular levels incompatible with the old order of life.

There is no knowing when my katydid arrived at the adult stage, but there is strong circumstantial evidence that he was a late arrival. If he was not he was a genuine Methuselah among katydids. However, of the hundreds singing in the hey day of life in August, a mere handful remain by mid-October. That these earlier arrivals have lived their lives and died, I have no doubt, for no healthy musically active meadow katydid or cricket, in my experience is at all inclined to become silent until he dies. My own little captive exemplified the universal law that life is a matter of an eternal striving for self expression. He sang night and day for three long months, purely for the love of his art as it seemed. When he ate he sent music from his wings; when he cleaned his feet and legs and face he played his runes. Life to him was a mood of dreamy sounds it would seem. Even though light and temperature affected his moods of music, there were incomprehensible physiological moods which now and then made him silent in spite of optimum conditions for his existence. This is not to be wondered at, however, for a life devoid of these freedoms of behavior, a life playing the role of a fixed and predetermined propulsion for every external level of conditions would be no life at all. The machine does that, and the katydid is no more a simple mechanism than are we humans.

The singing impulses of a katydid or a cricket are incomprehensible on any basis except as they represent the beginnings of an esthetic sense, an emerging appreciation of sound for its sake. This need not be assumed to be an impulse as external and as free as it is expressed in the musical moods of men. It is evident that the musical moods of the insect are racial dreams and unfoldings, somehow transforming its integuments at one point or another into musical appliances which the prescience of the insect unhesitatingly seizes upon for self-expression. Just as the moods and impulses of music are spontaneous, fundamental psychic abilities in the minds of men, these moods have a material projection in the case of the musical insects. Somehow the subconscious musical impulse is so profoundly in the racial makeup, so deep-seated and fundamental, that the organic constitution itself reflects its obsessing moods. Unquestionably this racial trend toward an impulse and expression apart from motives of pure utility is an impulse to art, however spontaneous and subconscious it may be. It is but the basic impulse of a more conscious art to follow, an impulse upon which the artistic moods and accomplishments of man have been built.

My little katydid knew no silence, except as it was the outgrowth of unfavorable conditions and the inhibitions of physiological moods which I could not analyze. Musical expression was the one obsessing behavior of its life until it died. The urge or sex seems a poor explanation of all this to my mind, and my own experience with the musical insects refutes it as the sole reason for musical moods. I see in this ceaseless desire to sing a fundamental mood of finding enjoyment in self-expression by making use of sound, and to the degree that it departs from utilitarian motives in this behavior, is it beginning to align itself wth the potentialities of art. If the cricket or the katydid sings for the enjoyment of its sound even to the least degree, esthetic sensibilities are as much back of its moods, unconscious or conscious, as they are back of the moods of man in his appreciations of the sounds of his more highly specialized musical art.

STUDIES IN THE DIPTEROUS FAMILY EPHYDRIDAE

PAPER II.

BY EZRA T. CRESSON, JR.

This is the second paper of a series presenting a study of the Ephydridae in the collection belonging to the Naturhistorischen Museums in Vienna and other material not strictly of the American faunae. However a slight deviation from the original intent of this series has been made in the present installment, mainly on account of the Vienna Collection possessing American material which should be reported herein.

The first paper[1] recorded the species belonging to the subfamilies Gymnopininae and part of the Psilopinae. The present one concludes the Psilopinae and continues with the Notiphilinae, which latter is not completed on account of the fact that several of the genera, particularly *Notiphlia*, *Hydrellia* and *Hydrina* are in need of more critical study with additional material.

In addition to the sources mentioned in the former installment, the writer is under obligations to the following for the loan of material: Mr. H. K. Munro, East London, South Africa [Munro], and Dr. Walther Horn, Deutsche Entomologisches Institut [D. E. I.].

Subfamily PSILOPINAE (continued)

Polythrichphora canora new species

This species belongs to the group which includes the American *Discocerina orbitalis* Loew, in having the broad white conspicuous frontal and facial orbits.

Black; palpi yellow; frons anteriorly, parafacials, antennae except second and third segments, apices of tibiae, tarsi except apices, tawny. Halteres white. Wings rather lactaceous with dark veins.

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[1] Trans. Am. Ent. Soc., LI, p. 227-258, (1925).

Opaque, densely brownish gray pruinose; face yellowish gray; frontal, facial, buccal orbits, and postbuccal area, white.

Head as broad as high; frons longer than broad; face one-half as broad as vertex, convex on lower part; in profile, not angularly produced at upper bristle; parafacials broad; facial series with the upper third and sixth bristles incurved, second, third, fifth and seventh, outcurved. Arista with five hairs. Second and third costal sections subequal. Fore femora with distinct postflexor bristles. Length, 2 mm.

Type.—Female; Tainan, Formosa, February, 1909, (Sauter), [A. N. S. P., No. 6330]. Paratypes.—3 ♀ ; topotypical.

Polytrichophora duplosetosa (Becker) new comb.
1896. *Clasiopa duplosetosa* Becker, Berl. Ent. Zeit., XLI, p. 162.

Among the undetermined material in the Vienna collection I found six specimens of this species from Austria.

Polytrichophora luteicornis new species

This species may prove to be synonymous with *Discocerina brunneicornis* Meijere, (1916). According to description it differs in having yellow antennae. The arrangement of the facial bristles, characteristic of the present genus, is not mentioned by Meijere; consequently his species may not belong here.

Black; antennae except upper surfaces, palpi, halteres, knees, tibiae, and tarsi, yellow; sometimes tibiae with median infuscation. Wings hyaline with pale veins. Opaque. Frons, mesonotum and scutellum, brownish-gray; lower frontal, and facial orbits, narrowly silvery; upper angle of second antennal segment with gray spot. Face, cheeks, and pleurae, gray. Abdomen black or faintly brownish pollinose.

Frons quadrate. Face abruptly narrowed medianly to one-half as broad as vertex; lower convex portion, prominent in profile; parafacials very narrow, not dilated below, micro-setulose; bristles in two series; the primary series of three or four pairs, converging; secondary series of three or four out-curved; there is also a mesally-inclined setula laterad of the upper secondary. Cheeks narrow, not as broad as third antennal segment. Antennal arista with four or five hairs. Fore femora stout with a postflexor comb of five or six small spines; hind tibiae without apical spur. Wings broad, rounded apically; second and third costal sections subequal.

Type.—♀ ; Singapore, 1898, (Biro), [Hungarian National Museum Collection].

Diclasiopa lacteipennis (Loew) new comb.
1862. *Discocerina lacteipennis* Loew, Mon. Dipt. No. Amer., I, p. 145..
1869. *Hecamede xanthocera* Loew, Ber. Nat. Ver., Augsberg., XX, p. 58. [syn. nov.].
1917. *Diclasiopa xanthocera* Hendel, Deut. Ent. Zeit., 1917, p. 42

The examination of the type of *Discocerina lacteipennis* in the Museum of Comparative Zoology at Cambridge, establishes to my satisfaction this synonymy. I can find no specific differentiation between the American and European specimens.

The Vienna Collection contained twelve specimens of this species determined by Schiner and three by Bergenstamm as *costata*. Among the undetermined material there were fifty-two specimens mostly from Austria.

Hecamedoides glaucella (Stenhammar)
1844. *Clasiopa glaucella* Stenhammar, Handl. K. Svenska Vet. Akad., 1843, p. 253
1917. *Hecamedoides glaucella* Hendel, Deut. Ent. Zeit., 1917, p. 41.

This is the genotype of *Hecamedoides* Hendel, 1914, which latter is separated from *Discocerina*, mainly on account of possessing a curved apical spur on the hind tibia. In the Vienna material I found twenty-seven specimens of this species from Austria, Bohemia, Tyrol and Albania.

Hecamedoides costata (Loew) new comb.
1860. *Hecamede costata* Loew, Neue Beitr., VII, p. 14.

This species has apparently been misunderstood by most students. I found specimens under this name in the Vienna collection which proved to be *Hecamede xanthocera*. It is very similar to *glaucella* but more robust, with bristles and setuale more numerous and stronger. Antennae except upper margin of third segment, pale; the proclinate and reclinate frontals widely separated, the former much nearer the strong proclinate orbital setula. Face with two to three bristles in the primary series including the upper on a distinct papilla; the upper secondary is well developed and opposite the upper primary. Cheeks one-fifth height of eye. Knees, tibiae and tarsi, pale, but hind tibiae somewhat infuscated medianly.

The species was originally described from Constantinople and the adjacent parts of Asia Minor. Becker records it from Egypt, and Czerny found it in Spain. All these are probably based on correct determinations. The above diagnosis is based on two specimens from Atabara, Egyptian Sudan, (Ebner, 1914), [Vienna].

Hecamedoides aurigera new species

This species has the frons uniformally pale golden yellow; wings glassy clear with second and third costal sections subequal; tibiae pale. It is apparently similar to *Discocerina hepatica* Meijere, 1916, from Java, but is larger.

Black; palpi, halteres, tibiae and tarsi, pale. Wings clear hyaline with pale veins.

Opaque, densely golden yellow pruinose on upper surfaces. Face, pleura and venter, light gray or tinged with yellow.

Frons quadrate. Face one-half as broad as vertex, at least twice as long as broad; median area between upper bristles subconically prominent in profile; a dorsally curved setula is situated laterad of the upper primary bristle, which latter is distinctly removed from the next below. Cheeks as broad as third antennal segment; arista with eight hairs. Fore femora with a postflexor comb of six small spines; hind tibiae with a stout apical spur. Wings long, pointed at tip of third vein; second and third costal sections subequal. Length, 2.5 mm.

Type.—Male ?; Simbang, Huon Gulf, New Guinea, (Biro: 1899), [A. N. S. P., no. 6331].

Hecamedoides caprina new species

The frons here is uniformly gray; wings somewhat whitish with second costal section much longer than the third, and the tibiae pale. The upper secondary facial is dorsolaterally curved.

Black; second antennal segment, papilla at base of upper fasial, palpi, apex of fore coxae, apex of femora, and entire tibiae and tarsi, pale; third antennal segment brown; halteres white. Wings whitish with pale veins.

Opaque, densely yellowish to whitish pollenose, but abdomen more shining and brown on dorsum of second to fourth segments. Frons and face evenly pollenose.

Frons slightly broader than long. Face nearly as broad as vertex. Cheeks broader than length of third antennal segment. Arista with six hairs. Prescutellar bristles present. Fore femora without noticeable flexor comb; hind tibiae with spur well developed. Length, 2 mm.

Type.—Female; Takao, Formosa, July 3, 1907, (Sauter), [A. N. S. P., no. 6332].

Paratypes.—1 ♂; Takao, November 18, 1907. 2 ♂; Tainan, Formosa, October 11, 1909, [Hungary].

Hecamedoides hyalinis new species

Frons uniformly brownish, tibiae dark, wings glassy clear with costal sections subequal.

In this species we have the usual upper facial bristle of the secondary series well developed, dorsolaterally curved and somewhat below the upper primary bristle, thus differing from *glaucella* and its allies.

Black; base of third antennal segment, halteres, bases of tibiae, and tarsi except apices, pale. Wings clear hyaline with pale veins.

Opaque, with fifth abdominal segment polished and slightly metallic tinged. Frons, mesonotum and scutellum olive brown. Face, cheeks, pleura and metanotum gray to olive gray tinged. Abdomen subopaque, black, sparingly gray basally.

Frons broader than long; lateral bristles approximate. Face two-thirds as broad as vertex, at least twice as long as broad; in profile, prominent and subturberculate at upper bristle; secondary bristle stout and out-curved. Cheeks as broad as third antennal segment. Antennal arista large with third segment noticeably pubescent; arista with five to six hairs. Fore femora with postflexor comb of three minute spines; hind tibial spur small. Wings narrow, pointed; second and third costal sections subequal. Length, 1.5 mm.

Type.—Male; Simbang, Huon Gulf, New Guinea, (Biro; 1899), [A. N. S. P., no. 6333].

A topotypical male has the abdomen but slightly more shining apically; wings broader with the second costal section at least twice as long as the third. This may represent another species.

Hecamedoides invida new species

In this species the frons has a more or less noticeably brown transverse stripe at the ocellar bristles; wings are whitish and tibiae dark. The upper secondary facial bristle is below the primary. In some respects the species suggests *Discocerina canolimbata* Meijere, 1916, but the wings are whitish not "glashell" as Meijere describes.

Black; knob of halteres and tarsi except apices, pale. Wings somewhat lactaceous with pale veins.

Opaque cinerous with abdomen blackish and somewhat shining. Frons brownish with vertex, anterior margin and orbits, whitish. Face and cheeks gray. Mesonotum and scutellum slightly ochraceous. Femora dark brown pruinose with middle and hind tibiae whitish in certain aspects.

Frons quadrate; face nearly as broad as long with the outcurved secondary bristle below apparently in the same series with the primary. Cheeks hardly as broad as third antennae segment. Arista with eight hairs. Fore femora with flexor comb of about six small spines; hind tibial spur long. Wings with second costal section distinctly longer than third. Length, 2 mm.

Type.—Male; Erima, Astrolabe Bay, New Guinea. (Biro; 1896), [A. S. N. P., no. 6334]. *Paratype.*—♀ ; topotypical.

Glenanthe ripicola Haliday

1839. *Glenanthe ripicola* Haliday, Ann. Nat. Hist., III, p. 104.

Two specimens in the Vienna Collection under this name, ("det. Schiner"), proved to be *Brachydeutera argentata* (Walker). Among the undetermined material I found eight specimens from Austria

Actocetor Becker

1903. *Actocetor* Mitt. Zool. Mus. Berlin, II, p. 169.

The facial profile in this genius is, typically, convex, without carina; with a facial series of about four bristles. That it is a member of the Psilopinae is evident from the frontal and thoracic chatotaxy, falling near *Discocerina.*

Genotype: *Ephydra margaritata* Wiedemann.

The described species which may be retained here are, besides the genotype, *A. beckeri* Meijere, and *A. elegans* Hendel, both from the East Indies. The South American *A. hendeli* Meijere, I cannot locate. I suspect that it represents a genus distinct from either *Actocetor* or *Trypetomima.*

Those species having the face subtuberculate, or medianly subcarinate, with one or two cruciate bristles on the lower portion only, may be removed to Becker's genus, *Trypetomima,* but I am not convinced of the validity of the latter. The presence of the erect bristles on the posterior margin of the abdominal segments is not of generic importance. The males of *margaritata* shows evidence of this characteristic. On the other hand *A. formosinus* is apparently congeneric with *Trypetomima pulchripennis* Meijere, described from Java.

Actocetor margaritatus (Wiedemann)

1830. *Ephydra margaritata* Wiedemann, Auss. Zweifl. Ins., II, p. 594.
1903. *Acetocetor margaritatus* Becker, Mitt. Zool. Berlin, II, p. 170, pl. 4c, figs. 27-29.

The Vienna Collection contained five males and one female of this species correctly determined, of which a male and female are labeled "Coll. Winth", from Egypt; the others are from Tenerife, ("det. Becker"). Wiedemann's original description was based on specimens ? from Egypt which he states are in the Berlin and his own collections. The above mentioned male in the Winthem Collection bears a second label "margaritata Wd. Egypt", and appears to be in Wiedemann's chirography. These six specimens may be part of the original series described by that student.

This is the genotype of *Actocetor* Becker.

Actocetor elegans Hendel

1917. *Actocetor elegans* Hendel, Deut. Ent. Zeit., 1917, p. 41.

This species was originally described from Colombo, Ceylon, and differs from *margaritatus* in the pale color of the thoroax and of the posterior margins of the first and second abdominal segments, as well as in the absence of the subapical clear spot in the marginal cell.

A female found among the undetermined material from Vienna labeled "Dr. Doleschal 1859 Amboina" agrees with Dr. Hendel's description, but has the first three abdominal segments entirely yellow.

Trypetomina Meijere

1916. *Trypetomina* Meijere, Tijd. v. Ent., LIX, p. 265.

It seems that we must confine this genus to those species allied to *Ephydra margaritata* Wiedemann having the face more restricted as to width medianly, somewhat subcarinate, and with one or two bristles each side. The abdominal bristles may or may not be present on the third and fourth segments.

We will therefore place here, besides the genotype, *Trypetomina pulchripennis* Becker, the three following species.

Trypetomina formosina (Becker) new comb.

1924. *Actocetor formosinus* Becker, Ent. Mitt., XIII, p. 90.

This species was originally described from Anping, Formosa. There is a specimen before me also from the same locality.

Trypetomina solitaria new species

This species is distinguished by having the cheeks very narrow, mesonotum somewhat shining, and the second vein abruptly bent before entering the costa. The dark legs and the isolation of the clear wing spots will separate this species from the next following. There is probably some variation in the color of the legs but the femora are likely to be dark. The isolation of the wing spots is constant in the series examined.

Black; antennae except upper margins, fore and middle tibiae apically, and all tarsi, yellow or whitish. Halteres white.

Subopaque to shining species; frons except orbits and ocellar triangle, opaque brown; face, cheeks, and lower occiput, somewhat gray; mesonotum sparingly dusted with brown; abdomen more shining. Wings densely fuscous, marked with more or less isolated clear spots, forming two discal and an apical, bands, arranged as follows: First band, subbasal, consisting of quadrate spots occupying the entire width of cells, beginning at the costa between tips of auxiliary and first veins, and attaining inferior margin, becoming faint beyond fifth vein; a round spot near base and one near apex of anal area; second band of three isolated, elliptical spots, transversing the wing, attaining inferior margin at tip of fifth vein; the apical band of two elliptical spots, each in apices of submarginal and first posterior cells.

Face weakly foveolate, one-third as broad as vertex, nearly three times as long as broad, with two bristles each side on lower half; cheeks not as broad as width of third antennal segment; arista with six to seven hairs. Apical scutellar bristles erect and cruciate; the male has about eight marginal bristles on fifth abdominal segment. Second vein angularly bent near tip, with a distinct appendage into submarginal cell at the bend; second and third sections subequal. Length, 1.4 to 2 mm.

Type.—Female; Guam Island, (D. T. Fulloway), [U. S. N. M., no. 21841]. *Paratypes.*—1 ♂, 5 ♀; topotypical.

A female from Friedrich Wilhelm Hafen, New Guinea, June, 1896, (Biro), [Hungary], seems to be conspecific.

Trypetomina completa new species

Very similar to *solitaria* but differing in the paler legs and more complete banding of the wings.

Black; antennae, face, cheeks, mouth parts, apex of scutellum, and all legs, yellow; halteres and fore coxae, white. Wings fuscous, with three broad, clear bands: first through middle of marginal cell, second just beyond the posterior crossvein, and the third near apex of wing.

Shining to polished species with metallic blue tinge. Frons except orbits and ocellar triangular opaque brown. Face somewhat gray.

Frons but slightly broader than long. Face one-third as broad as vertex, two and a half times as long as broad; foveae noticeably sharp; two bristles each side. Cheeks linear; tormae visible. Antennal spine as long as third segment; the latter as long as broad, subconical; arista with eight hairs. Scutellum flat with apical bristles erect and cruciate. Second vein subangularly bent near tip with a suggestion of an appendage; second and third costal sections subequal. Length, 2.4 mm.

Type.—Female; Guam Island, (D. T. Fulloway), [U. S. N. M., no. 21840].

Allotrichoma alium new species

This species is one of the group intermediate between *Ditrichophora* and *Allotrichoma,* in which the facial tubercle is recessive, discernible only as a weak conical convexity.

Black; knees, apical half of tibiae, and bases of tarsi, yellow. Halteres whitish. Wings immaculate, hyaline with pale veins.

Opaque, brownish; frons more blackish; narrow frontal orbits, lunule, face, cheeks, occiput below, second antennal segment above, broad notopleural stripe, broad mesopleural and sternopleural stripes, third to fifth abdominal segments of female, rounded, lateral spots on third and fourth segments of male, more or less gray to whitish. Tormae shining black.

Eyes rounded; frons slightly longer than broad; orbital and anteocellar bristles aligned. Facial tuberosity weak, the face scarcely more than slightly convex in profile. Cheeks about one-fourth eye-height. Arista with four to five hairs. Fourth abdominal segment of male twice as long as third, conical, with tubularly exerted genitalia, of which the lateral appendages are filiform, as very fine hairs. Wings short; second costal section two and a half times as long as third; second and third veins distinctly diverging. Length, 1.5 mm.

Type.—Male; Seleo, Berlinhafen, New Guinea, (Biro; 1896), [A. N. S. P., no. 6335]. *Paratypes.*—8 ♂, 8 ♀ ; topotypical.

Allotrichoma livens new species

Similar to *A. alium* Cresson but generally lighter in color; the frons, mesonotum, scutellum and abdomen with decided gray appearance. Face nearly white; in profile nearly flat; antennae also grayish tinged. Abdomen without lateral gray markings. Wings with pale veins, and nearly white basally.

Type.—Female; Bombay, (Biro; 1902), [Hungary National Museum Collection].

Allotrichoma biroi new species

Somewhat similar to the American *Discocerina simplex* Loew, which also belong in this genus, but in its more flattened face it is similar to *alium* Cresson.

Similar to *A. alium Cresson,* but face dark, concolorous with the mesonotum. Notopleural area and pleura evenly grayish. Hypopygium not exerted. Wings longer, with second vein nearly parallel to third, so that the third costal section is short, about one-fourth as long as the second. Length, 1.5 mm.

Type.—Male; Bombay, (Biro; 1902), [Hungary National Museum Collection].

Two females before me with the same data as the above male, may be conspecific, but they differ in the lower part of the face being conspicuously whitish pruinose, appearing like a band along the oral margin and includes the cheeks. The remainder of the face above the bristles, dark grayish. The mesopleura is more or less dark, leaving the notopleural region gray. Abdominal segments two to five with lateral gray spots which are elongate and oblique, not rounded

Allotrichoma laterale (Loew)

1860. *Hecamede laterale* Loew, Neue Beitr., VII, p. 13.
1896. *Allotrichoma laterale* Becker, Berl. Ent. Zeit., XLI, p. 121.
1926. *Allotrichoma laterale* Becker, Linder's Flieg. Pal. Reg., Lief. 56. p. 20, figs. 20 and 21.

The species of this genus are so homogeneous that only the males can be determined with any degree of certainty. Dr. Becker recognized the females of only two of the five species occurring in the palaearctic region, viz: *laterale* and *oceanum*. It is probable that the females of the other species, if they existed in the material he studied, were placed under *laterale*. Those determined as *oceanum* were probably associated with the males because of their similar habitat.

In working up the material in the Vienna Collection, I have therefore considered only the males. The descriptions and illustrations in Becker's works above cited are, with few exceptions, sufficient for the determinations in this sex.

The hypopygial appendages in the present species are about the length of the fourth abdominal segment.

In the Vienna Collection I found one specimen under this name determined by Bergenstamm which proved to be *Clasiopa glaucella* Stenhammar. In the undetermined material there were found nineteen males from Austria and Germany; also eleven females from the same locality which may or may not be this species.

Allotrichoma sciens new species

Superficially similar to *laterale* and the females are probably inseparable. The males, however, are very characteristic in the structure of the genitalia; the appendages here being massive, chitinizes, not hair like.

Black; base of all tarsi, yellowish. Halteres white. Wings immaculate, slightly obscured; veins dark.

Opaque, generally grayish. Frons blackish; orbits and lunule grayish. Face above brownish, below and including cheeks, gray; torma more or less gray. Mesonotum brownish above, with suggestion of vittae. Scutellum concolorous; mesopleura brown above. Abdomen almost shining, somewhat brownish. Legs grayish.

Frons broader than long. Face slightly longer than broad, conically tuberculous medianly; distance between upper bristles much greater than their distance above oral margin. Cheeks one-fourth eye-height; Arista with six hairs. Dorsocentral setulae series curving. Scutellum flat. Abdominal segment four of male as long as second and third together, pointed. Wings slightly pointed at third vein; second costal section four times as long as third. Lateral appendages of hypopygium thick, not hairlike, extending forwards one-fourth to one-third length of fourth segment, apical half compressed spoon-like dorso-ventrally, rounded apically, under surface with long hairs.

Type.—Male; Ahlbeck, Insel Usedom, Germany, August 14-22, 1923, (Zerny). [A. N. S. P., No. 6336].

Allotrichoma lasiocercum Cresson

1926. *Allotrichoma lasiocercum* Cresson, Trans. Am. Ent. Soc., LII, p. 251.

I find a male of this species in the Vienna Collection from Vienna, Austria, (Mik), which appears to be conspecific with the type described from California.

Allotrichoma filiforme Becker

1896. *Allotrichoma filiforme* Becker, Berl. Ent. Zeit., XLI, p. 123, pl. 5, fig. 7.

1926. *Allotrichoma filiforme* Becker, Linder's Fl. Pal. Reg., Lf. 56, p. 19, fig. 19.

Among the undetermined material from Vienna I found two males from Hammern, Austria, (Mik), which seem to belong here.

This species has been reported from Russia and Italy.

Allotrichoma perspiciendum (Becker) new comb.

1903. *Elephantinosoma perspiceindum* Becker, Mitt. Zool. Mus. Berlin, II, p. 180, pl. 14c, fig. 43.

Among the undetermined material from Vienna, I found four specimens of this species labeled "Elephantine, Aeg. Reimoser". Also one specimen labeled (1) "Albara, 3.V." (2) "Aegypt. Sudan, Ebner, 1914" (3) "Eleph. chnumi Beck. det Becker". This latter specimen has nothing by which it can be considered otherwise than a member of the genus Allotrichoma, as its similarity to *laterale* in general characteristics is evident.

Atissa pygmaea (Haliday)

1833. *Ephydra pygmaea* Haliday, Ent. Mag., I, p. 174.

1839. *Atissa pygmaea* Haliday, Ann. Nat. Hist., III, p. 404.

This species was originally described from Hollywood, on the north-east coast of Ireland, and has since been reported from Sweden, Germany, Italy, Egypt, Tunis, Canary Islands, and Spain. It is probable that these determinations are correct as the species seems to be wide spread, on the saline beaches and marshes of Europe and northern Africa. A form also occurs in North and Central America where it has been described as *Parephydra humilis* Coquillett, 1902.

Before me are the following material: One specimen from Novi, near Fiume, Jugo-Slavia, (Kertesz), and two from Elche, Alicante, Spain, (Czerny), determined, and kindly sent to me, by the late Dr. Kertesz; two others from Cairo, Egypt, determined by Dr. Becker and sent to me by the late Prof. Bezzi. There are also three females from Tainan, Formosa, (Sauter; October), [Hungary] which do not show any important dissimilarity from the European material. In the Vienna Collection there was a specimen under this name which proved to be *Atissa durenbergensis* Loew.

This is the genotype of *Atissa* and is distinguished by its concaved face, weak foveae and carina, projecting epistomal margin, and the facial bristles arranged in one series paralleling the oral margin. The ocellar bristles are situated somewhat behind the line of the anterior ocellus; mesonotal setulae in four well separated series; second costal section longer than the third. The general color is cinereous, with upper surfaces darker; antennae pale yellow.

Atissa suturalis new species

A typical member of this genus, with the facial bristles arranged similar to those of *pygmaea*, differing from all known species mainly in the irregular arrangement of the few acrostical setulae and the presence of well developed sutural dorsocentrals.

Black; halteres white. Wings brownish with black veins and posterior crossvein broadly clouded.

Opaque, dark brownish. Face, cheeks, lower occiput, pleura including humeri, but not notopleura, venter of abdomen, and femora, gray. Abdominal segments two and three with faint gray lateral spots.

The face is obtusely but distinctly carinate, forming a somewhat conical tubercle at epistomal margin; there are two upcurved facial bristles in the outer series, a strong one and a weaker, mesally curved bristle in the inner series; these series are almost parallel to the oral margin. Mesonotal setuale sparce; those at the sutural region stronger with a very strong pair in the dorsocentral series (this may be an individual variation); the others in the dorsocentral series relatively strong; two irregular series of acrosticals between the lines of the prescutellar. Second costal section longer than the third; ultimate section of posterior cross vein. Length, 1.3 mm.

Type.—Female; Sydney, New South Wales, Australia, (Biro; 1900), [A. N. S. P. no. 6337].

Atissa limosina Becker

1896. *Atissa limosina* Becker, Berl. Ent. Zeit., XLI, p. 132, pl. 4, figs. 20, 21; pl. 5, fig. 8.

Another typical member of the genus in having the same facial structure and arrangements of the ocellar and facial bristles, but differing from *pygmaea* in its more uniformally brown color; the parafacials, cheeks, and ventral surfaces, more grayish. Antennae mostly black. Mesonotal setulae in four series but anteriorly there may be six series in some individuals.

This species was originally described from Norway, and has been reported from England, France, Spain, and the Canary Islands. I cannot, however, certify these determinations although the species no doubt occurs in most of the saline environments of Europe.

Of this species I found three specimens in the Vienna Collection from Italy, determined by Schiner as *A. durrenbergensis* Loew, and among the undetermined material from Vienna, one individual from Vienna, (Mik).

Atissa hepaticoloris Becker

1903. *Atissa hepaticoloris* Becker, Mitt. Zool. Mus. Berlin, II, p. 163.
1912. *Allotrichoma litoralis* Cole, Rept. Laguna Mar. Lab., I, p. 160. [syn. nov.].

Very similar to *limosina* but the face is more carinate, with somewhat of a hump at the epistoma; the series of bristles run almost vertically, not subhorizontally, and there are one to two down-curved setulae along the parafacial groove. The position of the ocellars in relation to the anterior ocellus is the same as in *pygmaea*. The yellow-brown general color is also characteristic, and there are six series of mesonotal setulae.

This species was originally described from Egypt, but I do not doubt my determination of two specimens from Vienna, Austria in the Vienna Collection.

I cannot find any apparent specific characters by which the Cole's *litoralis* from North America can be considered distinct.

Atissiella kairensis (Becker) new comb.

1903. *Atissa kairensis* Becker, Mitt. Zool. Mus. Berlin, II, p. 162.

This species is placed in *Atissiella* on account of having the face prominent well up to the antennae; the foveae and carina reduced; the upper facial bristles dorso-laterally inclined; second costal section shorter than the third.

Of this species I have the following before me: Three specimens from Pavia, Italy, received from Dr. Bezzi as *A. pygmaea* determined by Becker, and a paratype also kindly sent me by Dr. Bezzi.

Atissiella durrenbergensis (Loew) new comb.

1864. *Atissa durrenbergensis* Loew, Zeit. f. Gessel. Naturw., Halle, XXIII, p. 346.

This species was originally described from the salt lakes of Durrenberg, Saxony, Germany, and has since been reported from Cairo and Assuan, Egypt,[2] Teneriffe, Canary Islands,[3] and Aldeburg, Suffolk, England.[4] As most of the determinations I have seen were wrong, I cannot verify all the above records for this species.

In the Vienna Collection, under this name I found three specimens determined by Schiner which proved to be *Atissa limosina;* and under *A. pygmaea*, I found an individual of the present species labeled: (1) "Atissa durrengergensis Lw" (2) "Mik" (3) "Roeder".

Elephantinosoma chnumi Becker

1903. *Elephantinosoma chnumi* Becker, Mitt. Zool Mus. Berlin, II, p. 180.

In the Vienna Collection I found three specimens under this name which were part of the series determined and recorded by Dr. Becker in his paper on the Diptera of the Anglo-Egyptian Sudan;[5] also a specimen of *E. perspiciendum* Becker which he misidentified as *chnumi* (the two species are not difficult to separate as the *perspiciendum* belongs to a different genus). I also have two specimens given me by Dr. Kertesz, labeled Assuan.

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[2] Mitt. Zool. Mus. Berlin, II, p. 162, (1903).

[3] Mitt. Zool. Mus. Berlin, IV, p. 151, (1908).

[4] Ent. Mo. Mag., XLVII, p. 183, (1911).

[5] Denks. Acad. Wien., XCVIII, p. 72, (1922).

Subfamily NOTIPHILINAE

The subfamily Notiphilinae is here recognized as containing those species having the lateral frontal bristles proclinate and reclinate, not strictly curving laterally over the eyes; face flat or convex, not strictly tuberculose, with median area bare; the facialia more or less paralleling the orbits. They have the general characteristics of the Psilopinae except that the acrosticals generally, and one or more of the dorsocentrals always, present.

The following genera known to me will fall into this subfamily: *Dryxo, Paralimna, Oedenops, Dichaeta, Phaiosterna, Notiphila, Typopsilopa, Hydrellia, Hydrina,* and *Ilythea.*

Dryxo lispoidea Robineau-Desvoidy

1830. *Dryxo lispoidea* Robineau-Desvoidy, Essai Myod., p. 787.
1913. *Dryxo ornata* Becker, Ann. Mus. Zool. St. Petersb., XVII, p. 651.
1926. *Dryxo lisopidea* Becker, Linder's Fl. Pal. Reg., Lf. 56, p. 93.

I recognize the genus *Dryxo* as distinct from *Cyphops* mainly on the white arista, the tesselated pattern of the abdominal markings, presence of distinct humeral bristles, presence of extensor bristles on the middle tibiae, and the long hairs on the hind tarsi of the males.

I follow Becker in recognizing *lispoidea.* My material is from India and Ceylon, and I consider it representing a species distinct from that occurring in Africa. I think we are justified in using Robineau-Desvoidy's name for this species.

Here we have the ocellar tubercle rather prominent, relieved by the depression of the surrounding area; the ocellar bristles weak but discernible, diverging, situated between the postocelli; inner verticals weak or indiscernible; abdomen rather narrow with subparallel lateral margins, the brown markings rather sharply defined; the long tarsal hairs of the males are somewhat curved at tips and are rather appressed, and confined mostly to the basal segment.

This species seems to be confined to the Indo-Malayan influence. It was originally described from "Sumatra". Dr. Becker reports it from Persia, and I have examined material from the following localities:

INDIA: Guindy, Madras, (Cragg), [U. S. N. M., 1].
CEYLON: Nalanda, (W. Horn; 1899), [D. E. I., 3].

Dryxo ornata (Macquart)

1843. *Blepharitarsis ornatus* Macquart, Dipt. Exct., II, (3), p. 254, pl. 34, fig. 5.

1862. *Corythophora longipes* Loew, Ofv. K. Svenska Vet. Akad. Forh., IV, p. 13.

1908. *Dryxo ornata* Bezzi, Denks. Med. Nat. Gesell. Jena, XIII, p. 194.

In this species the ocellar bristles are weak or indiscernible; humeral bristles strong; abdomen ovate, with outline of the brown markings rather indistinct, not sharply defined; the long tarsal hairs of the males are straight and almost equal in length on the first to third segments.

The species is, as far as known, mostly African in distribution. It was described from "Shubar", Sierra Leone?, and has been reported from Cape of Good Hope (as *Corythophora longipes* Loew), from Eritria, Canary Islands, Belgian Congo, Lake Tanyangiika, and South West Africa. I have material from the following localities:

BELGIUM CONGO: Landana. Kabinda, (J. Bequaert), [Bequaert, 1].

TANGANYIKA: Shirati, Victoria Nyanza, (Katona; February), [Hungary, 3].

UNION OF SOUTH AFRICA: Illovo, Natal, (W. H.; June), [Munro, 12]. Port Shepstone, Natal, (Munro; August), [Munro, 1.]. Dohne, Stutterheim, (Munro; May), [Munro, 7]. Barbertown, Transvaal, (Munro; August), [Munro, 8].

CANARY ISLANDS: Gomera, (Simony), [Vienna, 13]. Tenerife, (Simony), [Vienna, 7]. [These specimens determined by Becker].

Cyphops fasciatus Jaennicke

1867. *Cyphops fasciatus* Jaennicke, Abh. Senck. Gesel. Nat. Frank. a. M., VI, p. 368, pl. 43, fig. 14.

I recognize the genus *Cyphops* mainly on the following characters: Arista black; humeral bristle, the long tarsal hairs on the basal segments of the males, the extensors of the middle tibiae, and the long hairs on the basal segment of the males, absent; the brown abdominal markings forming a more or less fasciated pattern.

In this species the frons and mesonotum are rather uniformally gray, with a faint brownish pattern, and with brownish irrorations, not very noticeably vittate. The abdomen is dark with interrupted gray, subapical bands on the segments.

The species was originally described from Java, and has recently been reported from Formosa. I have examined material from the following localities:

FORMOSA: Koshun, (Sauter; August), [Hungary, 2].

BISMARK ARCHIPELAGO: Kinigunang, New Pommern, (Ribbe), [Hungary, 1.]

SIAM: Kho Sai, Dow, Trong, Lower Siam, (Abbott; January), [U. S. N. M., 1].

Cyphops digna (Osten Sacken) new comb.

1882. *Dryxo digna* Osten Sacken, Berl. Ent. Zeit., xxv, p. 241.

1882. *Dryxo spreta* Osten Sacken, Berl. Ent. Zeit., xxv, p. 242. [syn. nov.].

This species differs from *fasciatus* in having the frons and mesonotum dark, with grayish stripes. The synonymy of *spreta* is suggested; that species having been described from two poorly preserved specimens, and there is little in their description to separate them from those I have of *digna.*

The species was originally described from the Philippine Islands. I have the following localities represented in the material before me.

PHILIPPINE ISLANDS: Malinao, Tayabas, (Baker), [U. S. N. M., 2].

CELEBES: Samanga, (Fruhstorfer; November), [Vienna, 6].

KAREMA new genus

This genus differs from *Paralimna* in the absence of the anterior mesonotal bristles except on the humeri; from *Dryxo* in the convex frons which has a distinctly marked mesofrontal plate, and in the straight, transverse posterior cross-vein. The venation and general habitus suggests some species of *Parydra*, but in the slender legs with distinct extensors on the middle tibiae, and in the quadrate profile of the head, the simile ceases. On the other hand, in the profile of the head except that the parafacial is narrow, in the reduced chætotaxy, slender legs, and the long second vein paralleling the costa, the genotype suggests a relationship to the species of the genus *Dryxo.* It is apparently a connectant between the latter and *Paralimna.*

Genotype: *Karema loewella* new species

Karema loewella new species

Female.—Black; halteres pale yellow, knees and bases of tarsi ferruginous. Wings immaculate, brownish, more intensely infuscated towards costa.

Frons shining black, sparingly brown to golden pollenose, becoming dense at orbits between the frontal bristles and at the gray spot near antennae. Face and cheeks pale golden, sericeous, becoming gray at orbits. Upper occiput concolorous with frons. Antennae somewhat tawny; arsita black. Mesonotum and scutellum subopaque, black, obscured by golden pollen which becomes more dense anteriorly. Mesopleura golden, becoming whitish below as is also the metanotum. Abdomen rather shining, with second segment entirely, and a broad, complete subapical band on third to fifth, gray; bases of third to fifth brown; fifth more yellowish as are also the dark parts of the preceding segments in certain aspects.

Head quadrate in profile; ocellar tubercle well in advance of the vertical bristles; the anterior shining part of frons is somewhat flattened and elevated from the depressed anterior gray angles; cheeks one-half as high as eye; arista with ten hairs; facialia narrow, with hairs scarcely discernible. Posterior cross-vein straight, not parallel with inferior margin one-fourth as long as ultimate section of fourth vein. Length, 3.5 to 5 mm.

Chætotaxy: outer verticals strong; inner verticals weak; one reclinate frontal aligned with the weak pro-ocellars which latter are slightly in advance of the anterior ocellus; two to three proclinate orbital hairs; facials represented by scarcely discernible hairs; one weak buccal bristle. Mesonotum with widely separated, strong prescutellars, a strong postintraalar, a postalar, supraalar, and a notopleural; a distinct humeral; one mesopleural, a very weak sternopleural; four scutellars, the apical pair converging. Middle tibiae with four extensors.

Male.—Similar but smaller; the grays of the third and fourth abdominal segments are indistinct, that of the fifth, more yellowish.

Type.—Female; Barberton, Transvaal, (H. K. Munro; August 12, 1916), [Collection of H. K. Munro]. *Paratypes.*—One ♀; topotypical. One ♂; East London, (H. K. Munro: May 1, 1925).

A male from Simba River, (Kenya), British East Africa, ("Golsch. 1910"), [Vienna] is similar to the typical series but has the face darker.

Oedenops nuda (Coquillett) new comb.

1902. *Paralimna nuda* Coquillet, Jour. N. Y. Ent. Soc., x, p. 182.
1908. *Oedenops isis* Becker, Mitt. Zool. Mus. Berlin, ii, p. 178, [syn. nov.].

The comparison of the material before me of *Paralimna nuda* from North America, with a specimen of *Oedenops isis* from Egypt, determined by Becker, shows no differentiating characters of specific value, in fact, I can see no differences at all that one would consider other than of an individual nature.

Paralimna punctipennis (Weidemann) new comb.

1830. *Notiphila punctipennis* Wiedemann, Auss. Zweifl. Ins., II, p. 590.
1862. *Paralimna appendiculata* Loew, Mon. Dipt. N. A., I, p. 138. [syn. nov.].

In the Vienna Collection I found a specimen of *Paralimna* labeled "punctipennis Alte Sammlung" in good condition although somewhat greasy. This proved to be a female of *Paralimna appendiculata* Loew, and although the specimen bears no locality label, it agrees perfectly with Wiedemann's description of *P. punctipennis,* especially as to the positions of the very variable, appendages on the third vein. Furthermore Wiedemann states that the habitat of his specimen is unknown. Upon this evidence I feel justified in assuming this specimen to be at least part of Wiedemann's original series, and in labelling it "TYPE".

There is no doubt as to the conspecific status of the material before me under *appendiculata* and the type specimen in the Vienna Museum. It is certainly unfortunate that Loew's well known name is to fall, but it will cause no extensive confusion at this time.

The species occurs only in North America.

Paralimna picta Kertesz

1901. *Paralimna picta* Kertesz, Term. Fuzet., XXIV, p. 423, pl. 20, figs. 12 and 13.

This species, originally described from Simbang, New Guinea, is easily recognized by the distinct blackened posterior crossvein. The second antennal segment is gray above.

I have examined the following material:

BISMARK ARCHIPELAGO: Deslacs Island, [Hungary, 7].

PHILIPPINE ISLANDS: Davao, Mindanao, (F. C. Baker); Mt. Makiling, Luzon, (F. C. Baker), Los Banos, (F. C. Baker), [all Baker, 5]. Manila, (R. Brown), [U. S. N. M., 1].

Paralimna secunda Schiner

1868. *Paralimna secunda* Schiner, Reisa Novara, Zool., II, p. 241.

The Vienna Collection contains three females of this species labeled (1) "Lindig Venezuela" (2) "secunda Alte Sammlung"; one of which bears a third label "Paralimna secunda Sch.", which I have selected and labeled "TYPE". It is in excellent condition. Williston[6] suspected the synonymy of *secunda* and his *millipunctata,* and I think this is correct. The species occurs in the northern parts of South America and southern Central America.

Paralimna millepuncta Malloch

1925. *Paralimna millepuncta* Malloch, Proc. Linn. Soc. N. S. Wales, L, p. 325.

This species was based upon females from Eidsvold, Queensland, and Narrandera, New South Wales. I have before me twenty specimens of both sexes from Brisbane, Queensland, (Biro), [Hungary] which I consider this species.

Frons and mesonotum ochreous yellow; irrorations indistinct; face yellowish gray; cheeks, pleura, mesopleura slightly stained above, sharply defined subapical interrupted bands on second to fifth abdominal segments, gray; of the latter slightly arcuated medianly; extreme apical margins of abdominal segments broadly brown; fore femora of males without anterior flexor ciliation, but with some long bristles in the posterior flexor series. Frons as broad as long; eyes vertical; cheeks one-fourth as high as eye-height; antennae slightly above center line of eyes; arista with eight to ten hairs. Length, 4 to 5 mm.

Paralimna sana new species

Very similar to *P. ciliata* Cresson, 1916, with apparently few differentiating characteristics, but these seem to be constant in the series at hand.

Face with a distinct brown mark between the antennal foveae. The fore femora not noticeably flattened on flexor surface, nor their tibiae arched; anterior flexor bristles of fore tibiae in male weak, also posterior flexor series complete, of short bristles, not confined to basal portion. Posterior margin of abdominal segments at most narrowly brown; with the series of setulae situated close to the margins. Costa with third section about one-half as long as ultimate section of fourth vein.

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[6] Trans. Ent. Soc. London, 1896, p. 390, (1896).

Type.—Male; San Bernardino, Paraguay, (Fiebrig), [A. N. S. P. No., 6338]. *Paratypes.*—1 ♂, 1 ♀; topotypical. [U. S. N. M.].

Paralimna nigripes Adams

1905. *Paralimna nigripes* Adams, Kans. Univ. Sci. Bull., III, p. 178.

This species is distinguished by the entirely black tarsi, and long narrow face. General color of face seriseous lead-color with a brown spot between antennae attenuating as a line below to about middle of face; the buccal angle of face also brown. Pleura mostly brown. Fore femora of male with anterior flexor ciliation of numerous long curved flattened bristles.

The species was described from numerous specimens of both sexes from Salisbury, Rhodesia, South Africa, 5050 feet alt., May to June, 1900, (F. L. Show), [Kansas Univ. Colln.]. The following localities are represented in the material at hand:

Lor Marquez, (C. W. Howard; 9-10-1908), [U. S. N. M., 1]. Salisbury, Rhodesia, January, June, December, (F. L. Snow), [Kansas Univ., 22 "cotypes"]. Cape Colony, (Vienna, ?).

Two of the four specimens from Cape Colony are labeled "Notiphila fasciata Wied." but they do not agree with the description of that species which was originally described from the East Indies.

The late Prof. Bezzi [7] records this species from Ibadan, Nigera. I am not prepared to confirm this determination.

Paralimna arabica Becker

1910. *Paralimna arabica* Becker, Denks. Akad. Wiss. Wien, LXXI, p. 154.

The Vienna Collection possesses three males of this species labeled (1) "Arabica, Simony" (2) "Paral. arabica det. Becker". These specimens I labeled type and paratypes.

The fore femora of the males have the flexor ciliation of curved, flattened, bristles. The head is high with horizontal frons; the wings show a subapical costal infuscation.

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[7] Bol. Lab. Zool. Gen. Agr. Portici, VIII, p. 307, (1914).

Paralimna nubifer new species

Very much like *Paralimna arabica* Becker but is much darker. The brown markings being more intense and distinct. The brown and gray design of the abdomen very sharply defined.

These two species are characterized by the high head and face. The fore femora of the male has the anterior flexor ciliation of curved, flattened bristles.

Structurally this species is almost identical with *Paralimna turus* Cresson, described from Gautemala; differing in having a more or less subapical clouding on the wings of the males, which, however is sometimes faint to almost wanting. The orbital spot at antennae not very distinct except as a line of demarkation between the frontal and facial orbits. The arista has about fifteen hairs. The mesonotum does not show distinctly marked vittae, but there are irregular areas of brown, especially medianly. Upper facial area, especially between antennae, is rather brownish. Length, 5 mm.

Type.—Male; Walikale, Congo, 1 25′ S. 28 E. (J. Bequaert). [A. N. S. P. no. 6339]. *Paratypes.*—4 ♂, 6 ♀; topotypical.

Two males and a female from Congo, (Rovere), [Bezzi] appear to be conspecific with the above series, but the dark upper facial area is more intense, concolorous with the frons.

I have examined specimens of this species also from the following localities: Da Bas-Dahony, December, (D. Gaillard), [Bezzi, 4]. Simba River, British East Africa, (Gotschalk), [Vienna, 69].

Paralimna puncticollis Becker

1923. *Paralimna puncticollis* Becker, Denks. Akad. Wissen. Wien, CXVIII, p. 72.

1923. *Poecilothorax angustus* Becker, Denks. Akad. Wissen. Wien, CXVIII, p. 73, [syn. nov.].

The comparison of the type (♀) of *puncticollis* and the type (♂) of *Poecilothorax angustus* which are before me in the Vienna Collection, shows no differentiating characters of specific importance except that *puncticollis* has a greater number of aristal hairs, but the females of a series of specimens I determine as this species from other localities, show considerable variation in this respect, also in the width of the frons and face. Unfortunately the males before me lack the antennae.

The species is distinguished by the unornamented antennae and the brown pleura. The original description of this species states that it was based on a "♂ aus dem Zoolog. Garten von Khartum, 16, Februar 1914". In the Vienna Collection I found a female labeled (1) "Khartum 16, II, Zool. Garten" (2) "Aegypt. Sudan, Ebner, 1914" (3) "P. puncticollis Beck. det. Becker" which I consider the type of *puncticollis* and have so labeled it.

Poecilothorax angustus was stated to be described from a female with the same data as above mentioned for *puncticollis*. Dr. Becker was evidently in error regarding the sexes, for we cannot consider the possibility of the labels having been misplaced, because the specimens respectively agree with their original descriptions. A male in the same collection labeled as stated above for *puncticollis* except that the third label reads "P. angustus Becker. det. Becker" is no doubt Becker's type and is so labeled.

I also have a series before me of this species from: Ghinda, Eritrea, [Bezzi, 3]; Barberton, and Premier Mine, Transvaal, [Munro, 8].

Paralimna limbata Loew

1862. *Paralimna limbata* Loew, Ofv. K. Svenska Vet. Akad. Forh., XIX, p. 13.

This species was described from "Caffraria (Wahlberg)", and is recognized by the fuscous stripes on the frons, mesonotum and pleura, and the fuscous posterior crossvein.

Dr. Becker[8] records this species from Reuk and Tonga, Egyptian Sudan, (Ebner); a specimen of his series I have seen in the Vienna Collection. I would not be surprised to learn that this series is not conspecific with the type of Loew's species, but there are no discrepancies apparent upon comparison with the original description to warrant different treatment.

As here determined, this species does not seem to be a typical *Paralimna* although the costa attains the fourth vein, and there is no suggestion of the labyrinthine markings on the frons, nor irrorations on the mesonotum which are so characteristic of the species of this genus.

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[8] Denks. Akad. Wissen. Wien., XCVIII, p. 72, (1922).

Paralimna sinensis (Schiner) new comb.

1862. *Notiphila sinensis* Schiner, Reise Novara, Zool., II, p. 241.

This species has the silvery antennal spot; the face is long in profile, convex to slightly humped; color, brownish to ochreous, not contrasting with that of the frons; tormae concolorous. Fore femora of the male with anterior flexor ciliation of short, normal bristles. The mesopleura is marked with brown.

Type.—Male: Honkong, China, (Novara Reise), [Vienna Colln.]. *Paratypes.*—1 ♂, 1 ♀; topotypical. I have made the above selections and so labeled the specimens in the Vienna Collection.

Osten-Sacken [9] records this species from the Celebes. Hendel [10] notes its occurrence in Formosa. Before me, besides the type series is material from Koshun, Formosa, (Sauter), [Hungary, 4]; and Kodaikanal, South India, [Vienna, 1].

Paralimna concors new species

Very similar to *sinensis* Schiner, but the anterior flexor ciliation of the male fore femora consists of numerous, strongly flattened, curved, bristles, on basal three-fourths. These in *sinensis* are not strongly flattened. The general color is more yellowish; face more whitish; gray abdominal bands narrower, less than one-half length of segments; wings brownish tinged.

This species may have been confused with, and recorded under, *sinensis* by some authors.

Type.—Male; Baguio, Luzon, Philippine Islands, (W. Robinson), [U. S. N. M. no. 42037]. *Paratypes.*—4 ♂, 3 ♀; topotypical.

Additional specimens of this species are before me from Amboina, (Doleschal), [Vienna, 1]. and from the following localiies in the Philippine Islands: Mt. Makiling, Luzon, (Baker), [Baker, 3]. Davao, Mindanao, [Baker, 2]. Malinao, Tayabas, Luzon, [Baker, 1]. Puerto Princess, Palawan, [Baker, 1].

Paralimna cinerella Hendel

1914. *Paralimna cinerella* Hendel, Suppl. Ent., III, p. 107.

Another robust species similar to *sinensis*, but the head and face broader and proportionately shorter than in that species.

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[9] Ann. Mus. Civ. Genova, XVI, p. 492, (1881).

[10] Suppl. Ent., III, p. 106, (1914).

The general color is yellowish gray, with faint irrorations; the frontal orbital spot is not distinctly defined, but is velvety black in some aspects; third antennal segment paler than the second; mesopleura with upper margin and a median spot, of brown. The abdomen is yellowish; bases of third and fourth segments with narrow, interrupted brown bands, but the apical brown margins not sharply defined; no median brown stripe. Fore femora of male with anterior flexor ciliation of somewhat curved, slightly flattened bristles on median third, sometimes the series extend more basally.

This species was originally described from Formosa. I have seen specimens from the following localities in Formosa: Anping, (Sauter, September). Pilam, (Sauter, August); Taihorin, (Sauter, July); Tainan, (Sauter, April); [all Hungary, 4]. In addition there are before me specimens from: Peradeniya, Ceylon, (Dr. Uzel, November), and Guindy, Madras, India, (Cragg); [all Vienna, 3].

Paralimna minor Hendel[11] seems to be merely a small form of this species. The above specimen from Tainan, agree with Hendel's description, and I do not consider it distinct from the others. The occurrence of this species in Ceylon and India indicates considerable distribution, and I strongly suspect the synonymy of *P. punctata* Meijere,[12] which name would have priority, but Meijere's description does not seem to apply to the present species.

Paralimna ornatifrons Meijere

1914. *Paralimna ornatifrons* Meijere, Tijd. v. Ent., LVII, p. 246.

Although this species was originally described from Java, the series before me agree so well with the description that I do not hesitate to consider my determination correct.

Although simulating *sinensis* in general, this species as here recognized differs in having a variable reflecting, silvery spot above the velvety black fronto-orbital spot, and the median area above the antennae shining black. My series averages somewhat smaller than that of *sinensis*.

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[11] Suppl. Ent., III, p. 108, (1914).

[12] Tidj. v. Ent., LI, p. 164, (1908).

Material examined is from the following localities: Bombay, India, (Biro); Colombo, Ceylon, (Biro); [all Hungary, 7].

The specimen from Ceylon does not have the above described silvery fronto-orbital spot, but is apparently conspecific with the others.

Paralimna hirticornis Meijere

1913. *Paralimna hirticornis* Meijere, Bijdr. tot de Dierk., XIX, p. 65.

1913. *Paralimna nitens* Bezzi, Phil. Jour. Sci., VIII, Sec. D, p. 332, [syn. nov.].

1914. *Paralimna hirticornis* Hendel, Suppl. Ent., III, p. 104.

This well marked species was originally described from Saok, near Waigui Island. Hendel records it from Formosa.

The rather shining mesonotum with velvety black supraalar spot; the velvety black spot between the antennae, and the white under surfaces of the head and body are characteristic. The anterior flexor ciliation of the fore femora of the male are complete, of flattened bristles.

I cannot determine whether Meijere's or Bezzi's name has priority. Bezzi's paper is dated August, 1913, but I cannot find any definite date for the Meijere's paper. I am using *hirticornis* because my specimens agree better with Meijere's description.

The following material is before me:

FORMOSA: Kagi, (Sauter; August); Tainan, (Sauter; October); Takao, (Sauter; August); [all Hungary, 4].

PHILIPPINE ISLANDS: Davao, Mindanao, (Baker); Los Banos, (Baker); Mt. Makiling, Luzon, (Baker); [all Baker, 15].

Paralimna albonotata Loew

1862. *Paralimna albontata* Loew, Ofv. K. Svenska Vet. Akad. Forh., 1862, p. 13.

This species was originally described from "Caffraria", South Africa, and I have examined material almost topotpyical, from the following localities:

TRANSVAAL: Barberton, (Munro; May 18); Peddie, (Munro; December, 21); [all Munro, 5].

CAPE COLONY: Bedford, (Munro; February, 7); East London, (Munro; February 2 and 30, May, 21); [all Munro, 22].

The species is characterized by the silvery white spot on the second antennal segment, and the velvety black orbital spot laterad of the base of the antennae.

Becker[13] records this species from Formosa, but I question this determination. He probably had *Paralimna hirticornis* before him.

Paralimna molosus Schiner

1868. *Paralimna molosus* Schiner, Novara Reise, Zool., II, p. 242.

1916. *Paralimna puncticornis* var. *captiosa* Cresson, Trans. Am. Ent. Soc., XLIII, p. 122. [syn. nov.].

A female in the Vienna Collection labeled (1) "Lindig 1864. Venezuela." (2) "Paralimna molosus Schin." is no doubt the type of this species and I have labeled it as such.

A female from Bolivia, part of the series which I had determined as *captiosa,* seems to be conspecific with the above type. I see no structural differences of specific importance. It is therefore very probable that *captiosa* is synonymous, but the white spot on the second antennal segment is not conspicuous nor is the area flattened in the type of *molosus* as it is in *captiosa.* The male is unknown to me.

Paralimna javana van der Wulp

1891. *Paralimna javana* van der Wulp, Tijd. v. Ent., XXXIV, p. 215.

This species was based on a male from Java. Meijere[14] also records it from Semarang, Java. According to Meijere, and Hendel[15] *P. biseta* Hendel, 1914, differs only in its less distinct brown markings.

The series before me which I consider under this name may prove to be a variety or subspecies of *javana,* or a closely allied, distinct species, but I do not have sufficient material to justify such treatment.

Those having the brown markings more intense and distinct, may be considered typical; but this form I do not possess. Those in which the brown markings are not distinct to almost wanting, may be *biseta* Hendel. Of this I possess two specimens from Tainan, Formosa, (Biro, February), [Hungary].

Another form of which I possess but one specimen from Lonauli, Bombay, India, (Biro), [Hungary], is structurally the same as the others, but the dorsal surfaces of the head, thorax and scutellum are of a golden yellow tone. The brown abdominal bands do not attain the lateral margins, and they have a median posterior dilation giving the appearance of a median stripe.

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[13] Ent. Mitt. XIII, p. 89, (1924).

[14] Tijd. v. Ent., LXVIII, p. 205, (1924).

[15] Suppl. Ent., III, p. 106, (1914).

A series of two males from Brisbane, Queensland, Australia, (Biro), [Hungary], have the abdominal bands distinct and the median dilation completing a median stripe. I would consider these *P. atrimana* Malloch,[16] if the face of my specimens possessed "3 large bristles on each side" and the fore tarsi were black. The upcurved setulae above the humeri as described by Malloch is characteristic of *javana* as here recognized.

Paralimna confluens Loew

1862. *Paralimne confluens* Loew, Ofv. Svenska Vet. Akad. Fohr., 1862, p. 13.

1905. *Paralimna ornatipennis* Adams, Kans. Univ. Sci. Bull., III, p. 179. [syn. nov.].

The examination of paratypes of *ornatipennis* and comparison with other South African material is the basis of the above synonymy.

This species may be readily distinguished by the large velvety black fronto-orbital spots surrounding a small snow white one; also the white carinal spot between the antennae. The wings are marked with numerous transverse fuscous spots.

This species was originally described from "Caffraria", South Africa, and it probably ranges over much of South Africa. The type of *ornatipennis* is in the University of Kansas Collection. The following localities are represented in the material before me: Salisbury, Rhodesia, (F. L. Snow; June, December) [Kansas, 3; paratypes of *P. ornatipennis*]; Barberton, Transvaal, (H. K. Munro; April, June), [Munro, 2].

Phaiosterna aequalis new species

This species as compared with *P. decipiens* Loew of North America is smaller, and among the distinguishing characteristics may be mentioned the smaller number of aristal hairs and the lower position of the facial bristles.

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[16] Proc. Linn. Soc. N. S. Wales, L, p. 326, (1925).

Black, entirely opaque, particularly the frons; face, mesonotum, and scutellum, overcast with yellow pollen; pleura and abdomen and legs more grayish. A faint, narrow, median, mesonotal stripe, abbreviated posteriorly. Abdomen without the dark bases on the segments. Wings brownish.

Face slightly longer than broad, in profile vertical or slightly produced below the weak transverse depression at the middle of facial profile; two to three side bristles situated at the lower half of facial profile, of which the upper bristle is scarcely above the line of lower orbits. Cheeks scarcely broader than width of third segment; arista with 7 to 8 hairs. Length, 2 to 2.5 mm.

Type.—Male; Middle Anam, (Fruhstorfer), [A. N. S. P. no. 6340]. *Paratypes.*—1 ♂, 6 ♀; topotypical.

I also have this species from Tainan, Formosa, (Sauter), [Hungary, 8], and Mt. Makiling, Philippine Islands, [Baker, 1]. These specimens do not show any apparent differentiation from the type series.

Typopsilopa chinensis (Wiedemann) new comb.

1830. *Notiphila chinensis* Wiedemann, Auss. Zweifl. Ins., ii, p. 592.

There are two males and a female in the Vienna Collection which are no doubt cotypes of Wiedemann's species. The female is in the best condition, and this one I have selected as the type. It bears three labels (1) "chinensis det Wiedem" (2) "China Coll. Winth." (3) "chinensis Wied. China"; the latter probably Wiedemann's original label in his own hand. The male I labeled allotype and bears labels (1) "China Coll. Winth." (2) "chinensis det. Wiedem.". The remaining female is labeled paratype. These specimens are conspecific, differing in no apparent details, and are typical members of this genus, differing from *T. flavitarsis* Cresson, the genotype, mainly in the lower position of the facial bristles and less convex face. The head shows the frontal-facial profile more flattened and vertical than in *flavitarsis*, giving the head a more rectangular profile.

Black; halteres white; all tarsi except apically, yellow. Length, 1.75 mm.

Typopsilopa tonga new species

1922. *Psilopa polita* Becker, Denks. Akad. Wissens. Wien., xcviii, p. 72. [nec. Macquart, 1835].

This species was determined by Becker as *Psilopa polita* Macquart, but the presence of anterior dorsocentral bristles at once distinguishes the species from ***Psilopa polita***, a very common European species. I can not understand Dr. Becker failing to note these prominent, strong bristles, a character which readily distinguishes the members of this genus from those of *Psilopa*.

The present species differs from *chinensis* Wiedemann in having the three apical segments of the fore tarsi dark, the face shorter and frons longer, thus lowering the position of the antennae to near the center line of the eyes, which in *chinensis* are distinctly above. The relatively poorer condition of the typical series of *chinensis* (the only specimens I have seen of that species) deters me from offering more critical comparisons.

The species differs from the American *T. atra* (Loew) in having the antennae and fore tarsi, in part, pale.

Black; third antennal segment except upper margin, somewhat yellowish; halteres white; two basal segments of fore tarsi, entire middle and hind tarsi, yellow. Wings immaculate, yellowish. Shining to polished; at most faintly brown pollenose, with face faintly whitish. Frons depressed at antennae. Antennae situates about on center line of eyes; spine of second segment about one-half as long as third segment; the latter conical, not much longer than broad; arista with eight hairs. Face nearly as broad as frons, and nearly as broad as long, rather evenly, but not very noticeably convex medianly; upper bristles further apart than their distance above epistomal margin, slightly above line of buccal orbits, much stronger than the next lower bristle. Cheeks as broad as length of third antennal segment. Second costal section slightly longer than third. Length, 2 to 2.5 mm.

Type.—Female; Tonga, Egyptian Sudan, (Ebner; April 10-13, 1914), [A. N. S. P., no. 6341]. *Paratypes.*—2 ♀; topotypical, [Vienna Collection].

Ilythea spilota (Curtis)

1832. *Ephydra spilota* Curtis, Brit. Ent., IX, p. and pl. 413.
1839. *Ilythea spilota* Haliday, Ann. Nat. Hist., III, p. 408.

Five specimens of this species were found in the Vienna Collection correctly determined by Schiner and others. These were from "Dorpat", Berlin, and "Germany". Among the undetermined material there were two specimens from Hammern, Upper Austria, (Mik), and Zettwing, Bohemia, (Mik).

This species is quite common in North America.

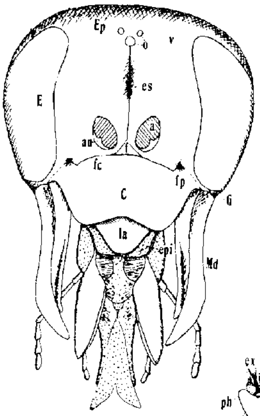


Fig. 1

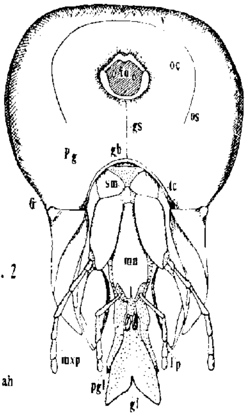


Fig. 2

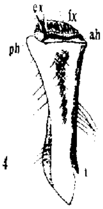


Fig. 4

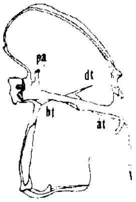


Fig. 3

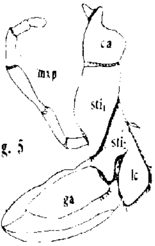
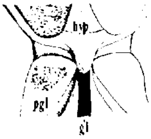


Fig. 5

Fig. 7



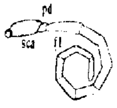


Fig. 8

Fig. 10

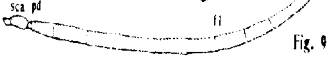
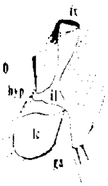


Fig. 9

Fig. 6



SALMAN—MORPHOLOGY OF PEPSIS ELEGANS

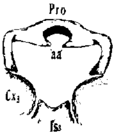


Fig. 13

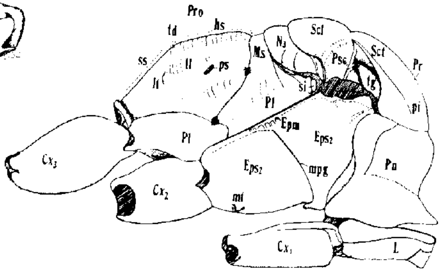
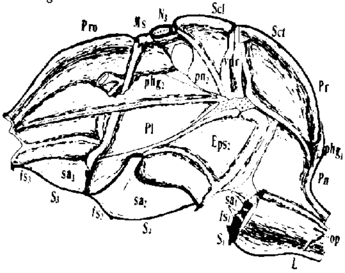


Fig. 11

Fig. 14



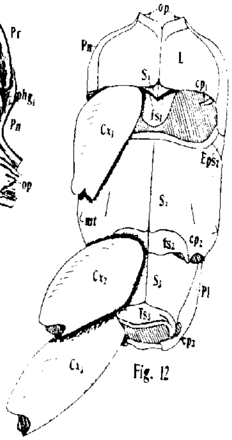


Fig. 12

Fig. 15

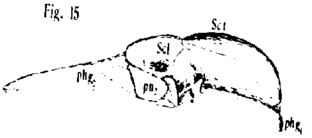


Fig. 18

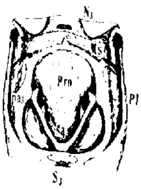


Fig. 17

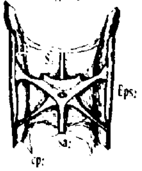
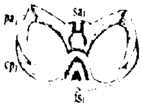


Fig. 16



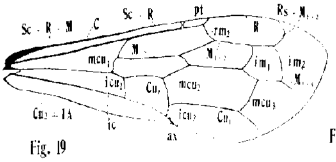


Fig. 19

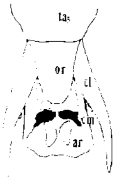


Fig. 28

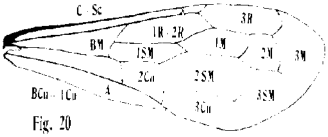


Fig. 20

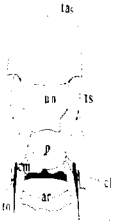


Fig. 27

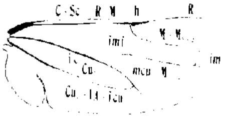


Fig. 21

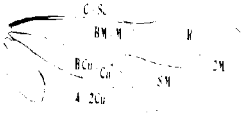
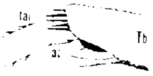


Fig. 22

Fig. 26



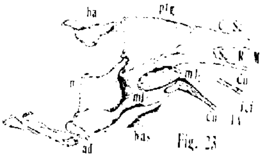
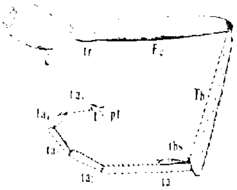


Fig. 23

Fig. 25



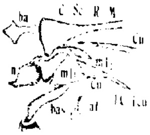


Fig. 24

SALMAN: MORPHOLOGY OF PEPSIS ELEGANS

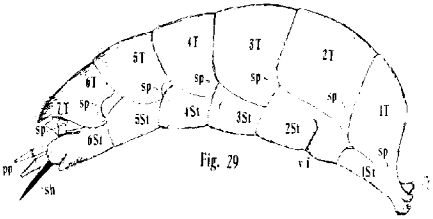


Fig. 29

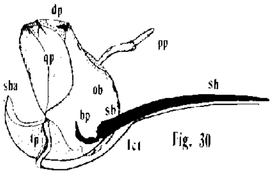


Fig. 30

Fig. 31

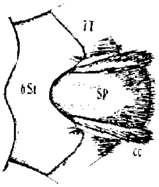


Fig. 32

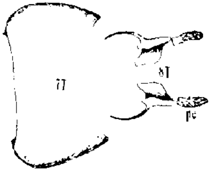


Fig. 33

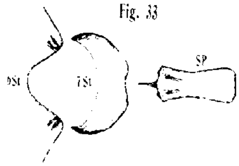


Fig. 34

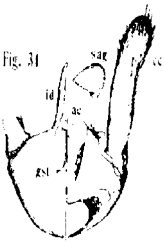


Fig. 35

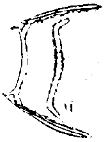
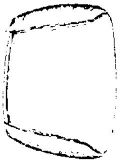


Fig. 36



SALMAN—MORPHOLOGY OF PEPSIS ELEGANS

THE MEMBRACIDAE OF SOUTH AMERICA AND THE ANTILLES. IV

SUBFAMILIES HOPLOPHORIONINAE, DARNINAE, SMILIINAE, TRAGOPINAE

(HOMOPTERA)

BY FREDERIC W. GODING
Livermore Falls, Maine

An attempt has been made, in this paper, to include all of the known Membracidae of South America and the West Indies in modern genera to which they pertain, based upon the plan adopted in my "Classification of the Membracidae of America"[1]. The subfamilies Aethalioninae, Centrotinae, and Membracinae have been treated elsewhere[2]. The present contribution embraces the subfamilies Hoplophorioninae, Darninae, Smiliinae, and Tragopinae, and includes a general index to the species of all the subfamilies.

While synoptical keys are a fairly accurate guide to the identification of species, in all doubtful cases the complete description should be referred to.

In the Lists of Species the original description is referred to; and where other works are mentioned those only having figures are given. For a complete index to the literature the cyclopedic Catalogue of the Membracidae by Dr. W. D. Funkhouser should be consulted.

My thanks are due to Dr. F. X. Williams and Mr. W. E. China for most of the drawings, and to Mr. E. T. Cresson Jr., for suggestions relative to the arrangement of this paper.

Since the part devoted to the Membracinae was published, I have identified *Cicada galeata* Stoll, (Cig. p. 4, pl. 11, fig. 52), from Surinam, Dutch Guiana, as a *Guayaquila* closely related to *G. olseni* with which it may prove to be identical.

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[1] Jour. New York Ent. Soc., xxxiv, p. 295-317, 1926.

[2] Aethalioninae, Jour. N. Y. Ent. Soc., xxxv, p. 183-191 (1927); Centrotinae, p. 391-406, pls. 19-20; Membracinae, xxxvi, p. 200-233, pl. 8, (1928).

Subfamily HOPLOPHORIONINAE

Tribe HOPLOPHORIONINI

PLATYCOTIS

Stal, Hem. Fabr., II, p. 36; *Orthoplophora* Fowler, Biol. Cen.-Am., Hom., II, p. 46.

Subgenus **PLATYCOTIS** Stal

Key to Species

One yellow species with a transverse line on the front, spot each side of pronotum, humerals, and line on tibiae, brownish black; humerals produced forward in short spines; tegmina sordid hyaline, marginal veins yellow, venation otherwise reddish, a black apical spot:

a. Dorsum of pronotum unarmed ....form *sordida*
aa. Dorsum with a porrect horn in front........form *sagittata*

List of Species

sordida Germar, Mag. Ent., IV, p. 17, (1821). [Brazil].
sagittata Germar, Mag. Ent., IV, p. 19, (1821). [Brazil].
affinis Buckton, Mon. Memb., p. 104, pl. 21, fig. 3a ♀, (1903). [Bogota, Colombia].

Subgenus **LOPHOPELTA** Stal

Key to Species

One greenish yellow species with a brown median line, one or two short lines each side and lateral margins reddish, two or four deep impressions in front and apex black; dorsum bearing at middle an obtuse compressed lobe. rarely aborted, its summit frequently reddish; tegmina hyaline, costa reddish, bases black sometimes with pale green spots.............*tuberculata*

List of Species

tuberculata Fairmaire, Rev. Memb., p. 273, pl. 6, fig. 9, (1846). Fowler Biol. Cen.-Am. Hom., II, p. 42, pl. 4, figs. 2-3, (1894). Buckton, Mon. Memb., p. 100, pl. 21, fig. 1, (1903). [California; Mexico; Kenacoff, Haiti].
ornata Fairmaire, Rev. Memb., p. 274, (1846). [Mexico].
discreta Fowler, Biol. Cen.-Am. Hom., II, p. 42, pl. 4, fig. 4, (1894). [Guatemala].

Subgenus **MICROSCHEMA** Stal

Key to Species

One pale yellow species; pronotum with a median carina more distinct at middle, and two obsolete irregular carinae each side; tegmina hyaline, venation pale yellow............*straminicolor*

List of Species

straminicolor Stal, Hem. Rio J., II, p. 25, (1862). [Rio Janeiro, Brazil].

Genus **METCALFIELLA**

Goding, Jour. N. Y. Ent. Soc., XXXVII, p. 7. [*Hoplophora and Hoplophorion* of authors].

GENOTYPE: *Metcalfiella pertusa* (*Hoplophora pertusa* Germar).

Key to Species

1 (14). Pronotum with two to four lateral carinae and a median carina.

2 (7). Dorsum of pronotum transversely gibbous behind humerals; tegmina hyaline.

3 (4). Lateral margins pronotum red, apex black usually sharply elevated, humerals strongly produced, acute, carinae yellowish green; pronotum yellow, costa of tegmina red; body black, legs yellow and black..............*ohausiana*

4 (3). Lateral margins pronotum concolorous, not red.

5 (6). Large; humerals strongly auriculate, black, tips truncate; posterior process nearly long as abdomen, apex rather obtuse; costa and veins tegmina concolorous; yellow, chest black, legs concolorous, hairy ....*cinerea*

6 (5). Small; humerals large and auriculate in ♀, small in ♂, posterior process short, acute; tegmina with dark markings across center, veins yellowish brown; yellow with black markings, body fuscous, legs testaceous ....*disparipes*

7 (2). Pronotum reddish to ferruginous or black, not transversely gibbous.

8 (13). Size large.

9 (10). Pronotum black, hairy, with median and lateral carinae, lateral margins and humerals red; tegmina brown, veins and costa red pale margined; body and legs black; (some examples with variable fuscous markings) ....*gigantea*

10 (9). Pronotum ferruginous red.

11 (12). Median and lateral carinae red; tegmina yellow hyaline, spots on bases and irregular transverse band of spots black ....*signoreti*

12 (11). Pronotum and tegmina immaculate, sometimes carinae and lateral margins reddish, a few black punctures anteriorly ....*unicolor*

13 (8). Size small; sides pronotum fuscous anteriorly, subapical band and extreme tip posterior process white, black between; tegmina testaceous, bases darker ....*concinna*

14 (1). Pronotum destitute of lateral carinae.

15 (18). Dorsum of pronotum transversely gibbous behind humerals; tegmina hyaline.

16 (17). Lateral margins red; pronotum yellow, black punctured, median carina concolorous; veins of tegmina red. *pertusa*

17 (16). Lateral margins pronotum concolorous; pronotum yellow and brown varied, gibbous elevation blackish, median carina strong anteriorly, brown; veins of tegmina reddish. *variegata*

18 (15). Pronotum not transversely gibbous behind humerals.

19 (28). Pronotum with a distinct median percurrent carina; tegmina hyaline.

20 (21). Median carina black anteriorly; pronotum yellow to reddish; veins of tegmina reddish or brown ..*monogramma*

21 (20). Median carina concolorous or red, not black anteriorly.

22 (23). Lateral margins and median carina concolorous, not red; pronotum fusco-testaceous varied anteriorly, hai subapical spot each side yellow, apex obtuse; tegmina w two obsolete fuscous fasciae not touching veins; chest bla legs yellow ....*ob*

23 (22). Lateral margins pronotum red; pronotum yello brown.

24 (25). Median carina red, pronotum yellow with some points, veins of tegmina red; abdomen and chest blac reddish ....

25 (24). Median carina concolorous, not red.

26 (27). Bases tegmina greenish, apical half costa, base exter vein of corium, tips femora and line on tibiae, cinnabar re pronotum greenish testaceous, hairy, with shining gold points; legs greenish ....*fimbria*

27 (26). Bases tegmina and costa concolorous, veins reddish, darker toward apices; pronotum green or yellow to ferruginous, black punctured, apex black; legs red with white hairs ....*proxima*

28 (19). Median carina indistinct, concolorous, not red; tegmina brownish or subhyaline.

29 (30). Dull reddish, pubescent, sometimes black punctured anteriorly, apex frequently strongly elevated, a large subapical black spot; tegmina brownish, veins piceous; (in some examples chest and three large spots in corium brown. *semitecta*

30 (29). Sordid yellow with large coarse punctures, and yellow and black pubescence; humerals large, auricular, red margined; posterior process short, broad, red margined, apex abruptly acuminate, tip red, shorter than abdomen; tegmina subhyaline, veins of costal and central basal cells red; body yellow, pubescent, front and middle tibiae yellow with red median bands, hind legs entirely yellow. .*rubripes*

List of Species

ohausiana Schmidt, Stet. Ent. Zeit., LXVII, p. 366, (1906). [Sabanilla, Cuenca, Ecuador].

cinerea Fairmaire, Rev. Memb., p. 272, (1846). Fowler, Biol. Cen. Am. Hom., II, p. 39, pl. 3, fig. 24, (1894). Buckton, Mon. Memb., p. 98, pl. 20, fig. 5, (1903).

obfuscata Fowler, Biol. Cen.-Am. Hom., II, p. 40, (1894). [Mexico; Central America].

disparipes Fowler, Biol. Cen.-Am. Hom., II, p. 40, pl. 3, fig. 25, (1894). [Central America].

gigantea Fairmaire, Rev. Memb., p. 269, (1846). Buckton, Mon. Memb., p. 98, pl. 20, fig. 4, (1903). [Colombia; Oriente, Ecuador].

signoreti Fowler, Biol. Cen.-Am. Hom., II, p. 39, pl. 3, fig. 23, (1894). [Mexico; Baños, Ecuador; Verrugas Cañon, Lima, Peru].

unicolor Fowler, Trans. Ent. Soc. Lond., p. 419, (1894). [Colombia].

carinulum Schmidt, Stet. Ent. Zeit., LXVII, p. 364, (1906). [Azogues, Ecuador].

concinna Fowler, Biol. Cen.-Am. Hom. II, p. 41, pl. 4, fig. 1, (1894). [Chiriqui, Panama].

pertusa Germar, Rev. Ent. Silb., III, p. 242, (1835). Buckton, Mon. Memb., p. 96, pl. 20, fig. 1, (1903). [Rio Janeiro, Brazil; Normandie, Ecuador].

porosa Walker, List Hom. Brit. Mus., p. 513, (1851). Buckton, Mon. Memb., p. 96, pl. 20, fig. 2. [Unknown].

variegata Fairmaire, Mon. Memb., p. 271, (1846). [Colombia].

monogramma Germar, Rev. Ent., III, p. 242, (1835). Buckton, Mon. Memb., p. 95, pl. 19, fig. 4, (1903). [Mexico; Guatemala].

sanguinosa Fairmaire, Rev. Memb., p. 270, (1846). [Mexico].

cribrum Fairmaire, Rev. Memb., p. 272, (1846). [Colombia].
figure Glover, Jour. Hom., pl. 1, fig. 2, (1878). [Unknown].
gloveri Goding, Cat. Memb., No. Am., p. 547, (1894). [Mexico].
apriformis Buckton, Mon. Memb., p. 95, pl. 19, fig. 4, (1903). [Colombia].

obtusa Stal, Hem. Rio J., II, p. 25, (1862). [Rio Janeiro, Brazil].

vicina Fairmaire, Rev. Memb., p. 270, pl. 6, fig. 10. Buckton, Mon. Memb., p. 99, pl. 20, fig. 6, (1903). [Colombia; Rio Janeiro, Brazil; Cuenca, Tarqui, Loja, Azogues, Baños, Ecuador].

fimbriata Stal, Hem. Rio J., II, p. 25, (1862). [Rio Janeiro, Brazil].

proxima Walker, List Hom. Brit. Mus., p. 531, (1851). [Quito, Ecuador].
pubescens Buckton, Mon. Memb., p. 96, pl. 19, fig. 5, (1903). [Bogota, Columbia].
haenschi Schmidt, Stet. Ent. Zeit., LXVII, p. 365, (1906). [Honda on Magdalena River, Colombia; Quito, Ecuador].

semitecta Walker, List Hom. Brit. Mus., Suppl., p. 129, (1858). [Rio Janeiro, Brazil; Venezuela].
erectum Schmidt, Stet. Ent. Zeit., LXVII, p. 364, (1906). [Quito, Ecuador].
nigromaculatum Schmidt, Stet. Ent. Zeit., IXVII, p. 365, (1906). [Quito, Ecuador].

rubripes Funkhouser, Jour. N. Y. Ent. Soc., XXX, p. 10, (1922). [Espirito Santo, Brazil].

Genus STALOTYPA

Metcalf, Ent. News, XXXVIII, p. 15; *Enchotypa* Stal, Hem. Fabr., II, p. 37.

Key to Species

1 (2). Metopidium nearly vertical, front horn long, produced forward, gradually acuminate, humerals conically produced. *fairmairi*

2 (1). Metopidium convex, front horn short, conical, acute, nearly erect, elevated above humerals .... *concinna*

List of Species

fairmairei Guerin, in Sagra's Hist. Cuba, Ins., p. 181, (1856); and p. 432, pl. 13, fig. 19, (1857). Metcalf and Bruner, Bul. Brook. Ent. Soc., XX, p. 206, pl. 1, figs. 10-11, (1925). [Havana, Santiago de las Vegas, Camaguey, Cuba].

concinna Fowler, Trans. Ent. Soc. Lond., p. 419, (1894). Metcalf and Bruner, Bul. Brook. Ent. Soc., XX, p. 207, pl. 1, fig. 12, (1925). [Santiago de las Vegas, Cuba].

Genus UMBONIA

Burmeister, Handb. Ent., II, p. 138, (1835). *Physoplia* Amyot and Serville, Hemip., p. 542, (1843).

Key to Species

1 (10). Dorsal horn pronotum well behind humerals; metopidium long, convex.

2 (9). Dorsal horn more or less recurved.

3 (8). Dorsal horn strongly recurved from base.

4 (5). Summit dorsal horn much enlarged; pronotum yellow to black with or without red stripes, sometimes entirely red. ♂ *crassicornis*

5 (4). Dorsal horn gradually acuminate, apex acute.

6 (7). Dorsal horn robust, base broad; pronotum reddish, green or yellow with yellow, red or green markings or stripes ....*reclinata*

7 (6). Dorsal horn very slender, filiform, summit black, pronotum luteus without red markings; form slender...*lutea*

8 (3). Dorsal horn lightly but distinctly recurved toward summit; pronotum yellow, median carina, two lateral vitae each side, and humerals red, slender ....*curvispina*

9 (2). Dorsal horn slender, straight, erect, median carina and vitta each side on metopidium red or black ....*ataliba*

10 (1). Dorsal horn pronotum between or just behind humerals; metopidium short.

11 (18). Dorsal horn pronotum straight, erect.

12 (17). Pronotum yellow, testaceous or pale green, with red or yellow vittae each side, sometimes with black vittae.

13 (16). Dorsal horn gradually acuminate from base to summit.

14 (15). Median carina of pronotum and two vittae each side, red ....*spinosa*

15 (14). Median carina and one vitta each side passing over metopidium, red; form slender ....*signoreti*

16 (13). Dorsal horn compressed, margins parallel, summit rounded, blackish spot above base and each side posteriorly, a red carina usually each side of summit; humerals marked with red and black ....*gladius*

17 (12). Pronotum unicolorous shining aluminum bronze (yellowish gray with clouded fuliginous shades under the lens); summit dorsal horn and irregular vitta at bases tegmina blackish; size and form as of *spinosa*, probably a local race. *sordida*

18 (11). Dorsal horn pronotum slightly but distinctly recurved toward summit.

19 (20). Dorsal horn broad at base, with yellow, red, and black vittae; pronotum green or testaceous; size variable. ♀ *crassicornis*

20 (19). Dorsal horn moderately slender at base, front margin of summit and tips humerals black; pronotum yellow or red, obscure spot on base metopidium; median carina, vitta each side on metopidium, another each side from summit not reaching lateral margin, red ....*amazili*

List of Species

crassicornis (♂) Amyot et Serville, Hemip., p. 543, pl. 10, fig. 1, (1843). Glover, MS Jour. Hom., pl. 1, fig. 21, (1878). Griffini, Bol. Zool. Anat. Comp., x, p. 2, f. 1, (1895). Buckton, Mon. Memb., p. 84, pl. 16, f. 2, (1903). [Jalapa, Mexico; Guatemala; Naranjito, Machala, Ecuador].

nigrata (♂) Amyot et Serville, Hemip., p. 543. Fairmaire, Rev. Memb., p. 275, pl. 6, fig. 7, (1846). Kirby, Element. Ent., p. 249, pl. 80, fig. 6. Buckton, Mon. Memb., p. 84, pl. 16, fig. 1, (1903). [North America; Florida; Guadalajara, Jalapa, Mexico; Venezuela; Brazil].

media (♂) Walker, List Hom. Brit. Mus., p. 516, (1851). Buckton, Mon. Memb., p. 85, pl. 16, fig. 3, (1903). [Mexico].

intermedia (♂) Walker, Ins. Saund. Hom., p. 66, (1858). [Colombia].

orizabae (♂) Fowler, Biol. Cen.-Am. Hom., II, p. 37, pl. 3, figs. 21-22, (1894). [Orizaba, Mexico].

peraceae (♂) Griffini, Bol. Zool. Anat. Comp., x, p. 3, fig. 2, (1895). [Brazil].

orozimbo (♀) Fairmaire, Rev. Memb., p. 277, pl. 6, fig. 2, (1846). Fowler, Biol. Cen.-Am. Hom., II, p. 36, pl. 3, figs. 15-20, (1894). Buckton, Mon. Memb., p. 86, pl 16, fig. 5, (1903). [Mexico].

decorata (♀) Walker, List Hom. Brit. Mus. Suppl., p. 130, (1858).

picta Walker, List Hom. Brit. Mus. Suppl., p. 130, (1858). Buckton, Mon. Memb., p. 85-86, pl. 16, fig. 4, (1903). [Brazil; Colombia; Mexico].

pyramidalis (♀) Fairmaire, Rev. Memb., p. 277, (1846). Buckton, Mon. Memb., p. 88, pl. 17, fig. 3, (1903). [Oxaca, Mexico; Brazil].

reducta (♀) Walker, List Hom. Brit. Mus., p. 520, (1851). [Para, Brazil].

reclinata (Germar, Rev. Ent. Silb., III, p. 243, (1835). Fairmaire, Rev. Memb., p. 276, pl. 6, fig. 3, (1840). Fowler, Biol. Cen.-Am. Hom., II, p. 34, pl. 3, fig. 12, (894). Buckton, Mon. Memb., p. 88, pl. 17, fig. 2, (1903). [Guerrero, Chilpancingo, Jalapa, Orizaba, Mexico; Vera Paz, Guatemala; Costa Rica; Brazil].

funesta Stal, Of. Vet. Ak. For., XI, p. 249, (1854). [Central America].

multiformis Walker, List Hom. Brit. Mus. Suppl., p. 129, (1858). [Mexico].

ermanni Griffini, Bol. Zool. Anat. Comp., x, p. 6, fig. 3e, (1895). [Mexico].

javanensis Buckton, Mon. Memb., p. 87, pl. 17, fig. 1, (1903). [Mexico].

subclivata Buckton, Mon. Memb., p. 88, pl. 17, fig. 4, (1903). [Mexico].

lutea Funkhouser, Jour. N. Y. Ent. Soc., xxx, p. 10, (1922). [Bolivia].

curvispina Stal, Hemip. Fabr., II, p. 38, (1869). Griffini, Bol. Zool. Anat. Comp., x, p. 6, fig. 3b, (1895). [St. Catherina, Espirito Santo, Brazil; Jalapa, Mexico].

spinosa Fairmaire, Rev. Memb., p. 276, (1846). [Brazil].

ataliba Fairmaire, Rev. Memb., p. 278, pl. 6, fig. 1, (1846). Fowler, Biol. Cen.-Am. Hom., II, p. 35, pl. 3, fig. 14, (1894). [South America; Caché, Costa Rica; Chiriqui, Panama; San Paulo, Brazil; Canelos, Ecuador].

lativitta Walker, List Hom. Brit. Mus., p. 520, (1851). [Brazil].

erecta Goding, Bol. Med. Cir. Guay., XVIII, p. 37, pl. 1, fig. 3, (1920); in Rev. Col. Vic. Roc., p. 13, pl. 1, fig. 4, (1921). [Rio Mangoriso, Oriente, Ecuador] (vittae are black).

spinosa Houttuyn, Nat. Hist., I, p. 257, pl. 81, fig. 2, (1766). Sulz, Hist. Ins., pl. 9, fig. 6, (1776). Griffini, Bol. Zool. Anat. Comp., x, p. 6, fig. 3a, (1895). [Santarem, Espirito Santo, Brazil; Merida, Venezuela; Cayenne, Dutch Guiana; Kartabo, British Guiana; Cuenca, Machala, Naranjito, Ecuador; Darien, Bugaba, Chiriqui, Peña Blanca, Tole, Panama; Teleman, Vera Cruz, San Isidro, Guatemala; Kamakusa, British Guiana].

arma Stoll, Cig., p. 83, pl. 21, fig. 116, (1788). [Surinam, Dutch Guiana].

armata Olivier, Enc. Meth., VII, p. 668, (1792). [Surinam, Dutch Guiana].

rectispina Stal, Bid. Memb. Kan., p. 265, (1869). [Bogota, Colombia].

sordida Goding, supra; (? variety). [Darien, Panama].

ladius Fairmaire, Rev. Memb., p. 275, pl. 6, figs. 4-5, (1846). Fowler, Biol. Cen.-Am. Hom., II, p. 38, pl. 3, fig. 13, (1894). Buckton, Mon. Memb., p. 89, pl. 17, fig. 6, (1903). [Campeche, Valladolid, Yucatan, Temax, Mexico; Venezuela].

mazili Fairmaire, Rev. Memb., p. 277, (1846). [North America; Mazatlan, Mexico; Central America; Panama; Normandie, Ecuador].

gnoreti Fairmaire, Rev. Memb., p. 278, pl. 6, fig. 6, (1846). [Colombia; Merida, Venezuela].

ataliba Buckton, Mon. Memb., p. 89, pl. 17, fig. 5, (1903). [North America; Central America; South America].

articularia Buckton, Mon. Memb., p. 89, pl. 17, figs. 7-8, (1903). [Belize, Honduras; Central America].

Tribe POTNIINI

Genus **ALCHISME**

Kirkaldy, Entomol., XXXVII, p. 279, (1904). *Triquetra* Fairmaire, Rev. emb., p. 279, (1846).

Key to Species

1 (4). Pronotum convex from base to apex, dorsum unarmed; green or yellow.

2 (3). Dorsum highest at middle, median carina reddish; humerals short, obtuse, directed forward and very slightly outward; apical cell of wings triangular, base angulate (metopidium sloping) .... *rubrocostata*

3 (2). Dorsum highest above humerals, metopidium vertical; humerals rather short, obtuse, directed outward and forward; median carina black; second apical cell of wings with sides parallel, base truncate .... *inermis*

4 (1). Dorsum elevated in a horn or angle.

5 (12). Dorsal horn pronotum behind humerals.

6 (7). Median carina black; dorsal horn small, erect, lightly inclined backward; humerals long, slender, acuminate, directed outward and slightly upward .... *recurva*

7 (6). Median carina concolorous, not black or brown.

8 (9). Dorsum elevated in an obtuse angle; pronotum yellow to dark brown; humerals directed forward .... *bos*

9 (8). Dorsum elevated in a horn.

10 (11). Abdomen and chest black; pronotum testaceous, spot at base and each side posteriorly, brown; dorsal horn small, conical; tegmina free, tips smoky .... *fastidiosa*

11 (10). Abdomen and chest pale yellow; pronotum testaceous; dorsal horn erect, long, rather slender, acuminate, sides with smooth rugae, sometimes lightly inclined forward.
turrita

12 (5). Dorsal horn or angle between humerals.

13 (16). Median carina pronotum black or brown.

14 (15). Dorsal horn very small and sharp; pronotum depressed, usually yellow or testaceous, rarely dark brown; humerals concolorous, directed forward, rarely lightly upward; tegmina yellow hyaline; body yellow gray ...... *nigrocarinata*

15 (14). Dorsal horn small, directed upward; pronotum well elevated above humerals, yellowish brown; humerals black, directed outward and very slightly forward; tegmina blackish; body yellow .... *ustulata*

16 (13). Dorsal carina pronotum concolorous or red, not black or brown.

17 (18). Dorsal horn very long, directed obliquely forward and upward, parallel with very long humerals; pronotum yellow or testaceous, chest black .... *apicalis*

18 (17). Dorsal horn erect or angulate only.

19 (22). Dorsum elevated in a horn.

20 (21). Median carina usually reddish with blackish punctures each side; dorsal horn medium, conical, without lateral rugae; humerals directed outward and slightly forward; pronotum greenish or testaceous ....*virescens*

21 (20). Median carina concolorous; dorsal horn rather long, base not broad, gradually acuminate, smooth rugae each side; pronotum dark reddish brown ....*truncaticornis*

22 (19). Dorsum elevated anteriorly in an angle, not cornute; metopidium almost straight above head; humerals oblique, acute ....*grossa*

List of Species

rubrocostata Blanchard, in Gay's Hist. Chile, Zool., VII, p. 272, (1852). Goding, Jour. N. Y. Ent. Soc., XXXVI, pl. 8, fig. 5, (1928). [Common in Chile; Mt. Naupan, near Cuenca, Ecuador].

unicolor Signoret, Ann. Soc. Ent. Fr., ser. 4, III, p. 584, (1863). [Chile].

inermis Fairmaire, Rev. Memb., p. 280, (1846). Buckton, Mon. Memb., p. 93, pl. 18, fig. 6, (1903). [Bogota, Caqueta, Almaguer, Colombia; Macas, Baños, Ecuador; Verruga Cañon, Lima, Peru].

recurva Stal, Bid. Memb. Ken., p. 266, (1869). [Bogota, Colombia].

nigrostrigata Buckton, Mon. Memb., p. 92, pl. 18, fig. 4, (1903). [Quito, Ecuador].

bos Fairmaire, Rev. Memb., p. 282, (1846). [Bogota, Colombia; Baños, Ecuador; Peru].

obtusa Buckton, Mon. Memb., p. 92, pl. 18, fig. 5, (1903). [Bogota, Colombia].

fastidiosa Fairmaire, Rev. Memb., p. 281, (1846). [Colombia].

angustata Fairmaire, Rev. Memb., p. 282, (1846). [Bogota, Colombia; Ecuador].

submaculata Buckton, Mon. Memb., p. 91, pl. 18, fig. 3, (1903). [Ecuador].

turrita Germar, Rev. Ent. Silib., III, p. 243, (1835). Fairmaire, Rev. Memb., p. 276, pl. 6, fig. 8, (1846). [Brazil; Baños, Ecuador; Peru].

obscura Walker, List Hom. Brit. Mus., p. 517, (1851). [Brazil].

veruta Fowler, Biol. Cen.-Am. Hom., II, p. 33, pl. 3, fig. 9, (1894). [Panama].

insipida Buckton, Mon. Memb., p. 94, pl. 19, fig. 1, (1903). [?].

nigrocarinata Fairmaire, Rev. Memb., p. 280, (1846). [Bogota, Colombia; Normandie, Ecuador].

tridentata Fairmaire, Rev. Memb., p. 280, (1846). [Bogota, Colombia].

intermedia Distant, Entom. Mo. Mag., XVII, p. 223, (1881). [Bogota, Colombia].

mucronata Buckton, Trans. Ent. Soc. Lond., IX, p. 330, pl. 21, fig. (1905). [?].

ustulata Fairmaire, Rev. Memb., p. 281, (1846). [Bogota, Colombia].

oppugnans Walker, List Hom. Brit. Mus. Suppl., p. 131, (1858). [Venezuela].

apicalis Walker, List Hom. Br. Mus., p. 518, (1851). Fowler, Biol. Cen. Am. Hom., II, p. 33, pl. 3, fig. 11, (1894). [Colombia; Bugaba, Panama].

virescens Fairmaire, Rev. Memb., p. 281, (1846). [Bogota, Columbia; Peru; Tovar, San Estaban, Venezuela; Normandie, Palmira, Chanquero, Naranjito, Ecuador; Chiriqui, Panama; Pacayas, Costa Rica].

virgata Fairmaire, Rev. Memb., p. 282, pl. 6, fig. 27, (1846). [Bogota, Colombia].

terribilis Walker, Ins. Saund. Hom., p. 66, (1858). [Colombia].

grossa Fowler, Biol. Cen.-Am. Hom., II, p. 32, pl. 3, fig. 10, (1894). Buckton, Mon. Memb., p. 91, pl. 18, figs. 1-2, (1903). [Guatemala; Costa Rica].

truncaticornis Germar, Rev. Ent. Silb., III, p. 244, (1835). [Brazil].

testacea Fairmaire, Rev. Memb., p. 281, (1846). [Bogota, Colombia].

grossa Fairmaire, Rev. Memb., p. 280, (1846). [Bogota, Colombia; Peru; Venezuela; El Oriente, Narangapata, Ecuador].

obtusa Fowler, Trans. Ent. Soc. Lond., p. 417, (1894). [New Granada; Ecuador].

Genus **HOPLOPHORION**

Kirkaldy, Ent., XXXIV, p. 6. *Hoplophora* Germar, Rev. Ent. Silb., I, p. 177. *Ochropepla* Stal, Bid. Memb. Kan., p. 268.

Key to Species

1 (4). Metopidium flat, highest in front of humerals forming an angle with dorsum; pronotum with a median carina and smooth elevated lines each side; dorsum straight or very lightly convex.

2 (3). Narrow, yellow or green, not tuberculate; metopidium largely fuscous; posterior process acuminate, lateral margins straight, apex reaching middle of abdomen; first apical cell of wings very small; (size 4 x 1 mm.) ......*triangulum*

3 (2). Broad, uniform brown, with a few minute tubercles; posterior process acuminate, lateral margins sinuate, apex slightly longer than abdomen; first apical cell of wings rather large (size 5.5 x 3.5 mm.) ....*dubium*

4 (1). Metopidium arcuate from base, not angulate at summit, highest between humerals; pronotum with a median carina and smooth elevated lines each side, lateral margins sinuate.

5 (8). Dorsum straight or very lightly convex behind humerals.

6 (7). Pronotum yellow, granulose, posterior process long as or longer than abdomen; sometimes a black dot in corium; body and legs concolorous .... *corrosum*

7 (6). Pronotum pale green or yellow, sometimes with black markings in front; posterior process shorter than abdomen; body fuscous; (size small) .... *hebes*

8 (5). Dorsum sinuate behind humerals; posterior process shorter than abdomen; pronotum yellow to fuscous with or without darker markings; (size medium) .... *inequalis*

List of Species

triangulum Germar, Mag. Ent., IV, p. 18, (1821). [Brazil; Huigra, Loja, Ecuador]. Resembles figure of *dubium* Fowler.

dubium Fowler, Biol. Cen.-Am. Hom., II, p. 45, pl. 4, fig. 7, (1894). [Chiriqui, Panama].

corrosum Fairmaire, Rev. Memb., p. 272, pl. 6, fig. 11, (1846). Buckton, Mon. Memb., p. 102, pl. 22, fig. 1, (1903). [Bogota, Colombia; Chiriqui, Panama].

punctum Fairmaire, Rev. Memb., p. 272, (1846). [Colombia].

concolor Walker, List Hom. Brit. Mus., p. 514, (1851). [Colombia].

hebes Walker, List Hom. Brit. Mus., p. 525, (1851). [Colombia].

pallens Stal, Bid. Memb. Kan., p. 268, (1869). Buckton, Mon. Memb., p. 102, pl. 21, fig. 4, (1903). [Mexico].

inaequalis Fowler, Biol. Cen.-Am. Hom., II, p. 44, pl. 4, fig. 8, (1894). [Chiriqui, Panama].

fuscata Fowler, Biol. Cen.-Am. Hom., II, p. 173, pl. 10, fig. 23, (1894). [Mexico].

Subgenus TRINAREA

Goding, Jour. N. Y. Ent. Soc., XXXIV, p. 305.

Key to Species

One elongate testaceous species, finely punctate, sides carinate, metopidium convex, lightly depressed behind humerals; posterior process tectiform, gradually acuminate, shorter than abdomen; tegmina with two brown fasciae; body brown .... *carinata*

List of Species

carinata Funkhouser, Jour. N. Y. Ent. Soc., XXX, p. 11, pl. 1, fig. 10, (1922). [Para, Brazil].

Genus POTNIA

Stal, Analecta Hemipterologica, p. 388. *Aconophoroides* Fowler, Biol. Cen.-Am. Hom., II, p. 47.

Key to Species

1 (6). Pronotum with a median carina but destitute of lateral rugae.

2 (5). Pronotum finely punctulate, metopidium vertical, front horn situate front of humerals.

3 (4). Posterior pronotal process about long as abdomen, front horn short, broad, porrect, lightly curved and more slender in ♀, summit obtusely rounded; testaceous or ferruginous. *granadensis*

4 (3). Posterior pronotal process long as abdomen, much shorter than tegmina, front horn oblique, more than twice longer than broad at base, slightly dilated at middle, summit obtuse; brown .... *affinis*

5 (2). Pronotum deeply and coarsely punctured with black, metopidium convex, front horn situate just behind humerals, projected upward and slightly forward, margins flat and black excepting yellow summit; posterior process lightly punctate, narrow, nearly long as tegmina, yellow.*rectispina*

6 (1). Pronotum with a median and lateral carinae or smooth rugae.

7 (8). Front of pronotum obtusely angulate anteriorly punctured, not produced in a horn; posterior process short, apex very obtuse; pale testaceous .... *perobtusa*

8 (7). Front of pronotum produced in a distinct horn.

9 (10). Metopidium convex, front horn short, broad, erect, black, a forked red carina each side, situate just behind humerals; yellow, venation red .... *venosa*

10 (9). Metopidium vertical, front horn porrect or oblique, situate in front of humerals; venation concolorous.

11 (14). Front horn porrect, short, twice longer than broad at base; posterior process nearly long as tegmina.

12 (13). Summit front horn acute; pronotum yellow with ferruginous punctures or brown, front horn concolorous. *jaculus*

13 (12). Summit front horn obtusely rounded, margins black a forked red carina each side; pronotum yellow or testaceous .... *nigrovittata*

14 (11). Front horn directed obliquely upward and some forward, long, more than three times longer than broad at base, summit obtuse, margins black a forked red carina each side; pronotum testaceous or ferruginous .... *gladiator*

List of Species

granadensis Fairmaire, Rev. Memb., p. 273, (1846). [Bogota, Colombia; Central America; Huigra, Ecuador].

brevicornis Fowler, Biol. Cen.-Am. Hom., II, p. 46, pl. 4, fig. 9, (1894). [Bugaba, Boquete, Caldera, David, Panama].

affinis Buckton, Mon. Memb., p. 103, pl. 21, fig. 3, (1903). [Bogota, Colombia].

rectispina Funkhouser, Can. Ent., XLVI, p. 404, pl. 24, fig. 9, (1914). [Bolivia].

perobtusa Fowler, Trans. Ent. Soc. Lond., p. 418, (1894). [Rio Janeiro, Botafogo, Brazil].

venosa Germar, Mag. Ent., IV, p. 19, (1821). [Brazil].

jaculus Fabr. Syst. Rhyng., p. 12, (1803). [Cayenne, Dutch Guiana].

indicator Fairmaire, Rev. Memb., p. 279, pl. 6, fig. 14, (1846). [Cayenne, Dutch Guiana].

projecta Funkhouser, Can. Ent., XLVI, p. 405, pl. 24, fig. 10, (1914). [Bartica, British Guiana].

nigrovittata Walker, List Hom. Brit. Mus., p. 539, (1851). [Unknown].

jansoni Fowler, Trans. Ent. Soc. Lond., p. 418, (1894). [Demerara, British Guiana].

gladiator Walker, List Hom. Brit. Mus., p. 567, (1851). Fowler, Biol. Cen.-Am. Hom., II, p. 48, pl. 4, fig. 11, (1894). [Para, Brazil; Bugaba, Panama; Kartabo, British Guiana].

lata Walker, Ins. Saund. Hom., p. 69, (1858). [Para, Brazil].

gigantea Butler, Cist. Ent., II, p. 352, pl. 7, fig. 15, (1878). [Ega, Brazil].

sicula Buckton, Mon. Memb., p. 100, pl. 21, fig. 2, (1903). [Amazons, Brazil].

Subfamily DARNINAE

Tribe DARNINI

Genus **HEBETICA**

Stal, Hem. Fabri., II, p. 32; *Paralobia* Goding, Jour. N. Y. Ent. Soc., XXXIV, p. 306.

Key to Species

1 (4). Pronotum with spots.

2 (3). Large, elongate, apex acute; pronotum testaceous yellow, greenish anteriorly, a transverse curved spot at middle posterior process .... *apicalis*

3 (2). Much smaller, rather stout, testaceous red, lateral margins anteriorly and large oblique quadrangular spot each side touching lateral margins behind humerals yellow. *arechavaletae*

4 (1). Pronotum without distinct spots, fuscous or testaceous and greenish yellow reticulate.

5 (6). Lateral margins pronotum testaceous, apex black; or pronotum blackish brown with or without yellow dots; chest and abdomen fuscous, legs yellow; tegmina vitreous, costal cells yellow hyaline front of middle, veins fuscous. *convoluta*

6 (5). Lateral margins concolorous, pronotum yellow with small pale green spots which more or less coalesce, apex brown; tegmina and legs yellow; sides of chest blackish, pubescent .... *limacodes*

List of Species

apicalis Fairmaire, Rev. Memb., p. 483, (1846). [Brazil].

arechavelatae Goding, Ent. News, XXV, p. 400, (1914). [Uruguay].

convoluta Fabricius, Spec. Ins., II, p. 318, (1781). Walker List Hom. Brit. Mus., p. 578, pl. 4, fig. 8, (1851). Buckton, Mon. Memb., p. 119, pl. 24, fig. 1, (1903). [Rio Janeiro, Constancia, Tejuca, Brazil].

flavicincta Germar, Mag. Ent., IV, p. 11, (1821). [Brazil].

atomaria Germar, Mag. Ent., IV, p. 12, (1821). [Brazil].

limax Buckton, Mon. Memb., p. 112, pl. 22, fig. 7. [Brazil].

limacodes Burmeister, Rev. Ent. Silb., IV, p. 175, pl. 36, figs. 13-16, (1836). [Tejuca, Brazil].

cuneata Butler, Cist. Ent., II, p. 341, pl. 7, fig. 4, (1878). [Rio Dagua, Colombia].

Genus **STICTOPELTA**

Stal Hem. Fabr., II, p. 32; *Cryptoptera* in part, Hem. Fabr., p. 32; *Leptosticta* Stal, Hem. Fabr., p. 32.

Key to Species

1 (8). Lateral margins pronotum yellow.

2 (3). Marginal yellow stripe extended from behind eyes nearly to posterior apex; pronotum brown, shining, finely punctulate, head and legs yellow, tegmina lurid ...... *latilinea*

3 (2). Marginal yellow stripe not extended to eyes.

4 (5). Apex pronotum black, pronotum reddish, greenish yellow on sides and dorsum .... *fraterna*

5 (4). Apex pronotum concolorous.

6 (7). Marginal yellow stripe extended from behind humerals to middle posterior process—an elongate spot; pronotum ferruginous yellow to black, sometimes fuscous banded, front margin white bordered with black and lateral margins sometimes black .... *adusta*

7 (6). Marginal yellow stripe extended from behind humerals almost to apex; pronotum testaceous to fuscous, yellowish anteriorly, sometimes a median yellow stripe .....*flaviceps*

8 (1). Lateral margins pronotum concolorous.

9 (10). Apex posterior process black, pronotum testaceous, shining, finely punctate, legs yellow, tegmina vitreous, veins yellow ....*indeterminata*

10 (9). Apex pronotum concolorous.

11 (12). Front of pronotum with an arcuate red spot; olivaceous yellow, body brown, legs yellow, costa, base and tips tegmina brown ....*cruenta*

12 (11). Front of pronotum concolorous, without a red spot.

13 (14). Size large, broad, robust; pronotum testaceous yellow slightly black punctate, reddish anteriorly, obtusely angular towards apex; chest black, margins abdominal segments and tip reddish; sides black; tegmina pale brown tips darker, bases yellow ....*squarus*

14 (13). Size medium.

15 (16). Not slender; fuscous, lightly punctulate anteriorly, strongly punctured posteriorly; middle of vertex, spot each side pronotum, abdomen, tibiae and tarsi ferruginous, tegmina brown ....*praecox*

16 (15). Slender, elongate, acute posteriorly; olivaceous yellow, sometimes mottled with green; chest usually black; tips tegmina brownish ....*acutula*

List of Species

latilinea Walker, List Hom. Brit. Mus. Suppl., p. 147, (1858). [Rio Janeiro, Constancia, Brazil; Uruguay].

fraterna Butler, Cist. Ent. II, p. 340, (1878). [Peru; Mexico].

adusta Burmeister, Rev. Ent. Silb., IV, p. 170, (1836). [Mexico].

bipunctata Burmeister, Rev. Ent. Silb., IV, p. 171, (1836). Fowler, Biol. Cen.-Am. Hom., II, p. 55, pl. 4, fig. 19, (1894). [Mexico].

polita Butler, Cist. Ent., II, p. 339, pl. 7, fig. 1, (1878). [Ega, Brazil].

flaviceps Burmeister, Rev. Ent. Silb., IV, p. 169. Buckton, Mon. Memb., p. 113, pl. 23, figs.1-3, (1903). [Rio Janeiro, Constancia, Para, Amazons, Brazil; Cachabi, Ecuador; Uruguay; Argentina].

limbata Burmeister, Rev. Ent. Silb., IV, p. 175, (1836). [Brazil].

indeterminata Walker, List Hom. Brit. Mus. Suppl., p. 148, (1858). Fowler, Biol. Cen.-Am. Hom., II, p. 59, pl. 5, fig. 5, (1894). [Santarem, Amazons, Brazil; Kartabo, British Guiana; Bugaba, Chiriqui, Caldera, Panama; Central America; Mexico].

luisae Berg, Hem. Argent. Add. et Emend., p. 151, (1884). [Cordoba, Argentina].

cruenta Burmeister, Rev. Ent. Silb., IV, p. 173, (1836). [Brazil].

squarus Fairmaire, Rev. Memb., p. 482, pl. 5, figs. 23-24, (1846). [Cayenne, Dutch Guiana; Flores, Manaos, Brazil].

robusta Walker, List Hom. Brit. Mus., p. 579, (1851). [Para, Brazil].

praecox Burmeister, Rev. Ent., IV, p. 173, (1836). [Peru; Mexico].

acutula Fairmaire, Rev. Memb., p. 481, (1846). Fowler, Biol. Cen.-Am. Hom., II, p. 60, pl. 5, fig. 6, (1894). Buckton, Mon. Memb., p. 117, pl. 23, fig. 7, (1903). [Rio Janeiro, Brazil; Uruguay; Chiriqui, Panama; Central America; San Jancinto, Chira Valley, Peru].

brevis Fairmaire, Rev. Memb., p. 483, (1846). [Mexico].

Genus **ALOBIA**

Stal, Hemip. Fabr., II, p. 32.

Key to Species

One pale olivaceous yellow species, apex pronotum black, humerals obtuse; tegmina concolorous, costal cells punctulate. *alutacea*

List of Species

alutacea Stal, Hem. Fabr., II, p. 32, (1869). [Surinam, Dutch Guiana].

Genus **DARNIS**

Fabricius, Syst. Rhyngota, p. 25; *Cryptoptera* Stal, Hemip. Fabr., II, p. 32, (in part).

Key to Species

1 (6). Lateral margins pronotum yellow.

2 (5). Dorsum without transverse yellow bands posteriorly.

3 (4). Dorsum with a yellow spot between humerals; pronotum brownish black, lateral margins greenish yellow; a small yellow spot on head; bases tegmina and apical band and chest black; abdomen and legs greenish yellow; size large .... *cyclops*

4 (3). Dorsum concolorous brown to black between humerals, spot on head, spot each side, broad lateral margins pronotum sometimes occupying nearly all of sides leaving only a narrow median black stripe, yellow, the lateral stripe extending from eyes; tegmina piceous hyaline, body black, legs mostly yellow; size medium .... *lateralis*

5 (2). Dorsum brown to black, lateral margins reaching from front lateral angles and interrupted at humerals, almost to apex; one or two spots at base and median stripe on metopidium, and three transverse bands on dorsum—First at base posterior process sometimes interrupted at middle or absent, second at middle, third subapical, yellow; legs yellow; tarsi brown .... *trifasciata*

6 (1). Lateral margins pronotum concolorous.

7 (8). Very large; pronotum coarsely punctured, pale fuscous or olivaceous; humerals acute, apex usually curved upward. *cuneata*

8 (7). Size medium; pronotum very finely punctulate, pale olivaceous sometimes green, apex brown; tegmina vitreous; costal cells pale yellow hyaline front of middle; veins fuscous .... *olivacea*

List of Species

cyclops Fairmaire, Rev. Memb., p. 479, (1846). [Colombia].

lateralis Fabricius, in Coq. Ills. Ins., II, p. 78, pl. 18, fig. 9, (1801). Guerin, Reg. An., p. 61, pl. 89, fig. 3, (1846). Buckton, Mon. Memb., p. 113, pl. 22, fig. 8, (1903). [Brazil; Cayenne, Dutch Guiana; Kartabo, British Guiana; Chiriqui, Panama; Mexico; Mojave Desert, California].

latior Fowler, Biol. Cen.-Am. Hom., II, p. 52, pl. 4, fig. 16, (1894). [Chiriqui, Panama].

trifasciata Fabricius, Sust. Rhyng., p. 28, (1903). [Tapajos, Rio Janeiro, Amazons, Brazil; Kamakusa, British Guiana].

capistrata Burmeister, Rev. Ent., IV, p. 172, (1836). [Brazil; Cayenne, Dutch Guiana].

bifasciata Amyot and Serville, Hem., p. 545, pl. 11, fig. 7, (1843). [Cayenne, Dutch Guiana].

disrupta Walker, Ins. Saund. Hom., p. 74. [Amazons, Brazil].

partita Walker, Ins. Saund. Hom., p. 75, (1858). Fowler, Biol. Cen.-Am. Hom., II, p. 52, pl. 4, fig. 15, (1894). [Amazons, Brazil; Central America; Bugaba, Chiriqui, Panama].

cuneata Butler, Cist. Ent., II, p. 341, pl. 7, fig. 4, (1878). [Constancia, Brazil].

olivacea Fabricius, Syst. Rhyng., p. 28, (1903). [Rio Janeiro, Constancia, Brazil].

prasina Fairmaire, Rev. Memb., p. 482, (1846). [Venezuela].

infixa Walker, List Hom. Brit. Mus. Suppl., p. 149, (1858). [Venezuela[.

Genus **OCHROLOMIA**

Stal, Hemip. Fabr., II, p. 32; *Hebeticoides* Fowler, Biol. Cen.-Am. Hom., II, p. 52.

Key to Species

1 (2). Lateral margins pronotum, two spots on base, stripe each side leading above humerals, precurrent median carina, yellow, apex black; the yellow margins extend from humerals almost to apex .... *suturalis*

2 (1). Lateral margins pronotum concolorous.

3 (4). Posterior pronotal process with two arcuate transverse bands on dorsum and median stripe on metopidium, yellow; pronotum fuscous; body and legs black; tibiae yellow. *tricincta*

4 (3). Pronotum without transverse yellow bands.

5 (6). Pronotum greenish testaceous, rather deeply and densely punctate; exterior discoidal cells of tegmina normal. *virescens*

6 (5). Pronotum brown, closely punctured, front part black sides paler but no defined lateral stripes; margins abdominal segments yellow; exterior discoidal cells of tegmina minute .... *confusa*

Note: on page 306 of the "Classification", line 7, 12 (11), for *eyes* read *each other*.

List of Species

suturalis Germar, Rev. Ent. Silb., III, p. 250, (1835). Buckton, Mon. Memb., p. 112, pl. , fig. 6, pl. 22, fig. 6, (1903). [Brazil].

tricincta Burmeister, Rev. Ent., IV, p. 172, (1836). [Brazil].

virescens Butler, Cist. Ent., II, p. 338, pl. 7, fig. 3, (1878). [Rio Janeiro, Brazil].

confusa Fowler, Biol. Cen.-Am. Hom., II, p. 54, pl. 4, fig. 18, (1894). [Chiriqui, Panama].

Genus DECTONEURA

Butler, Cistula Ent., II, p. 342; *Tropidarnis* Fowler, Biol. Cen.-Am. Hom., II, p. 60.

Key to Species

One elongate depressed testaceous yellow species; posterior apex reddish nearly broad as at middle, truncate and tridentate, with median carina strongest on posterior half; chest greenish; abdomen red. (Two species have been reported from Mexico.) *laticauda*

List of Species

laticauda Fairmaire, Rev. Memb., p. 483, (1846). Butler, Cist. Ent., II, p. 343, pl. 7, fig. 21, (1878). [Constancia, Brazil].

Genus CYPHOTES

Burmeister, Handb. Ent., II, p. 143; Rev. Ent. Silb., IV, p. 179.

Key to Species

1 (2). Larger; head quadrangular, apex truncate; one-half each dorsal node extended beyond lateral margins; on oval cell towards bases between radial and ulnar veins; four apical cells; fuscous, yellow pubescent; nodes and legs testaceous .... *nodosa*

2 (1). Smaller; head triangular, apex acuminate; dorsal nodes much smaller not extended beyond lateral margins; dorsum lightly tuberculate, strong median carina and some raised lines toward apex; venation similar without the oval cell; greenish yellow, broad median fuscous stripe from apex of head to between dorsal nodes .... *insoleta*

List of Species

nodosa Burmeister, Handb. Ent., II, p. 143, (1835), Rev. Ent. Silb., IV, p. 181, pl. 36, figs. 1-4, (1836). [Para, Brazil].

insoleta Goding, Trans. Am. Ent. Soc., LII, p. 106, (1926). [Tena, Ecuador].

Genus **ASPONA**

Stal, Hemip. Rio Janeiro, II, p. 29.

Key to Species

1 (8). Lateral margins pronotum seen from above parallel from humerals at least to middle, then acuminate; dorsum with numerous irregular rugae or elevated lines.

2 (7). Lateral margins parallel nearly to posterior apex, then abruptly acuminate; head produced forward.

3 (4). Pronotum tuberculate, grayish black, posterior process fulvous; tegmina blackish, bases fulvous; legs piceous. *aspera*

4 (3). Pronotum not tuberculate, dorsum transversely impressed at middle and posteriorly, tumescent between.

5 (6). Olivaceous yellow or brown, disk obscure ferruginous, median carina pale, dorsum strongly tumescent; head and legs black (colors variable); tegmina with one discoidal cell. *bullata*

6 (5). Fusco-ferruginous indistinctly testaceous variegated, dorsum slightly swollen; tegmina with two discoidal cells; legs testaceous; tarsi brown (colors variable) ...*turgescens*

7 (2). Lateral margins parallel to middle posterior process then gradually acuminate; dorsum indistinctly depressed at middle, punctuation in rather regular rows; greenish and yellow variegated .... *intermedia*

8 (1). Lateral margins pronotum seen from above gradually acuminate from humerals to posterior apex, punctures in regular rows, elevated lines weaker; head produced downwards; greenish, dorsum yellow variegated, large spot each side touching lateral margins posterior process and apex yellow, legs testaceous .... *cuneata*

List of Species

aspera Walker, List Hom. Brit. Mus. Suppl., p. 151, (1858). [Villa Nova, Brazil].

bullata Stal, Hem. Rio Jan., II, p. 29, (1862). Buckton, Mon. Memb., p. 109, pl. 22, fig. 3, (1903). [Rio Janeiro, Brazil].

turgescens Fowler, Biol. Cen.-Am. Hom., II, p. 50, pl. 4, fig. 12, (1894). [Mexico; Central America].

intermedia Fowler, Biol. Cen.-Am. Hom., II, p. 51, pl. 4, fig. 13, (1894). [Bugaba, Panama].

cuneata Fowler, Biol. Cen.-Am. Hom., II, p. 51, pl. 4, fig. 14, (1894). [Chiriqui, Panama].

Genus HYPHEUS

Stal, Bid. Hem. Syst., p. 557.

Key to Species

1 (2). Fusco-ferruginous, pubescent, with darker spots; body and legs pale ferruginous .... *ursus*

2 (1). Pale yellow, dorsal carina black, green streak behind dorsal protuberance; body and legs yellow .. *viridistrigatus*

List of Species

ursus Fairmaire, Rev. Memb., p. 306, pl. 5, fig. 10, (1846). [Bogota, Colombia].

viridistrigatus Walker, List Hom. Brit. Mus. Suppl., p. 145, (1858). [Tejuca, Brazil].

Genus ATYPA

Laporte, An. Soc. Ent. Fr., I, p. 225. *Heliria* Buckton, Mon. Memb., p. 198.

Key to Species

1 (4). Metopidium seen from side sinuate, its summit produced forward; dorsum bigibbous; legs black.

2 (3). Dorsal humps inflated, second one largest, first one flat above; posterior process much shorter than tegmina, a large triangular apical spot and head yellow .... *gibba*

3 (2). Dorsum more compressed, first hump acutely rounded, second hump forming an angle its obtuse summit; posterior process long, slender, long as tegmina; entirely brown or piceous .... bucktoni

4 (1). Metopidium strongly reclined backward; dorsum bigibbous, moderately inflated, first hump convex, second hump broader and lower; pronotum yellowish, margins humerals black; posterior process with irregular testaceous band, apex acute, nearly long as tegmina; legs testaceous.·.*gibbosa*

List of Species

gibba Laporte, An. Soc. Ent. Fr., I, p. 225, pl. 6, fig. 5, (1832). [Brazil].
anoflava Buckton, Mon. Memb., p. 198, pl. 43, fig. 4, (1903). [South America].

bucktoni nom. nov. *gibba* Buckton, Mon. Memb., p. 197, pl. 43, fig. 2, (1903). [Bogota, Columbia].
[Bogota, Colombia].

gibbosa Walker, List Hom. Brit. Mus. Suppl., p. 142, (1858). Goding, Jour. N. Y. Ent. Soc., XXXVI, pl. 8, figs. 10-13, (1928). [Ega, Brazil].

Genus **PARADARNOIDES**

Fowler, Trans. Ent. Soc. Lond., (1894), p. 422.

Key to Species

1 (2). Pronotum black, lateral margins narrowly white behind humerals, apex ferruginous, body black, legs red. *ignipes*

2 (1). Pronotum testaceous anteriorly, sometimes a fuscous patch each side converging on metopidium, broadly fuscous behind humerals, body fuscous, legs testaceous....*severini*

List of Species

ignipes Fowler, Trans. Ent. Soc. Lond., p. 424, ♂, (1894). [Guadeloupe, West Indies].

severini Fowler, Trans. Ent. Soc. Lond., p. 425, ♀, (1894). [Guadeloupe, West Indies].

Genus **CYMBOMORPHA**

Stal, Analect. Hemipt., p. 388. *Aulacotropis* Stal, Hemipt. Fabr., II, p. 34.

Key to Species

1 (10). Apex of head obtusely rounded, dorsum pronotum with weak transverse rugae or smooth elevated lines each side.

2 (7). Dorsum highest at or front of middle.

3 (6). Head shorter than broad between eyes.

4 (5). Apex pronotum extended far beyond tips tegmina; pronotum olivaceous, finely dotted with fuscous, legs red, tibiae with black stripes ....*rubropedalis*

5 (4). Apex pronotum about reaching tip abdomen, much shorter than tegmina, destitute of two small impressions on metopidium; apex of head transversely impressed within front margin; pronotum olivaceous testaceous with or without a median dorsal fuscous stripe, tegmina concolorous hyaline, or pronotum ferruginous or black, tegmina fusco-olivaceous hyaline, base and costa black ....*olivacea*

6 (3). Head double longer than broad between eyes; pronotum yellow testaceous, shining, lateral margins anteriorly and apical part brown .... *amazona*

7 (2). Dorsum highest behind middle; head shorter than broad.

8 (9). Posterior pronotal process much longer than abdomen; pronotum yellow to brown with a median black or fuscous stripe entire or interrupted; tegmina yellowish hyaline, usually a brown spot at interior angle .... *vaginata*

9 (8). Posterior pronotal process about long as abdomen, dorsum high almost conical behind humerals; head three times wider than long; pronotum green or testaceous, shining, median line pale red; tegmina colorless, bases costae and veins green, yellow at tips, exterior discoidal cell large, curved, black spot on interior angle .... *bipuncta*

10 (1). Head triangular, apex angulate; dorsum smooth, shining.

11 (14). Apex pronotum longer than abdomen, nearly long as tegmina; pronotum with lateral black stripes or spots.

12 (13). Dorsum pronotum moderately elevated, highest at middle; pronotum yellow, dorsal carina brown, an oblique black stripe each side anteriorly; tegmina transparent, costae and abdomen black, legs yellow .... *nigrofasciata*

13 (12). Dorsum strongly elevated, highest behind middle; pronotum testaceous red, a large piceous spot on disk anteriorly sometimes fading to pale ferruginous not touching margins, large subapical circular black spot each side; tegmina piceous to brown to yellow apical cells; body and legs dull yellow .... *atromaculata*

14 (11). Apex pronotum long as abdomen, middle of dorsum highest, without lateral fasciae or spots.

15 (16). Green or testaceous, shining, carina black; tegmina hyaline, costa fuscous; margins abdominal segments black in male .... ♂ *prasina*

16 (15). Yellow and ferruginous irrorate, median carina concolorous, yellow spot at base and apex posterior process; tegmina vitreous, veins mottled, apical cells slightly curved; body and legs yellow .... *nitidipennis*

List of Species

rubropedalis Buckton, Mon. Memb., p. 139, pl. 29, fig. 7, (1903). [South America].

olivacea Fabricius, Syst. Rhyng., p. 10, (1903). [South America].
obtusa Fabricius, Syst. Rhyng., p. 11, (1903). [South America].

amazona Stal, Analect. Hemip., p. 388, (1866). [Parintius, Northern Brazil; Iquitos, Peru; Napo River, Ecuador].

vaginata Germar, Rev. Ent. Silb., III, p. 233. Buckton, Mon. Memb., p. 139, pl. 29, fig. 6, (1903). [Rio Janeiro, Brazil; Kartabo, British Guiana].

campestris Fairmaire, Rev. Memb., p. 292, (1846). [Brazil].

dorsata Fairmaire, Rev. Memb., p. 293, (1846). [Brazil].

similis Walker, List Hom. Brit. Mus., p. 556, (1851). [Brazil].

aequalis Walker, List Hom. Brit. Mus. Suppl., p. 133, (1858). [Ega, Teffe, Brazil].

persistans Walker, List Hom. Brit. Mus. Suppl., p. 338, (1858). [Tunantins, Brazil].

bipuncta Walker, List Hom. Brit. Mus., p. 556, (1851). [Para, Brazil].

spinigera Walker, List Hom. Brit. Mus., p. 557, (1851). [South America].

nigrofasciata Fairmaire, Rev. Memb., p. 292, pl. 5, fig. 2, (1846). [Brazil].

atromaculata Goding, Jour. N. Y. Ent. Soc., XXXVII, p. 11, (1829). [Tena, Cuenca, Ecuador].

prasina Germar, Rev. Ent., III, p. 234, (1835). Fowler, Biol. Cen.-Am. Hom., II, p. 80, pl. 6, fig. 11. [Brazil; Bugaba, Chiriqui, Panama; Central America; Mexico; Tena, Narangapata, Ecuador].

lepida Walker List Hom. Brit. Mus. Suppl., p. 133, (1858). [Constancia, Brazil].

nitidipennis Funkhouser, Jour. N. Y. Ent. Soc., XXX, p. 14, pl. 2, fig. 1, (1922). [Para, Brazil; Iquitos, Peru].

Genus **PARAGARGARA**

Goding, Jour. N. Y. Ent. Soc., XXXIV, p. 245. [*Paragara* (error)]. *Paragargara*, Jour. N. Y. Ent. Soc., XXXIV, p. 307.

Key to Species

One piceous brown pubescent very small species, median line piceous, base posterior process, coriaceous part of tegmina, ferruginous, margins segments and apex abdomen and legs paler; apical half tegmina hyaline, transverse band at apical third and spot on apex clavus, brown; apical half apex posterior process curved strongly upward .... *tholoides*

List of Species

tholoides Goding, Jour. N. Y. Ent. Soc., XXXIV, p. 246, (1926). Goding, in present paper, pl. X, fig. 6, (1929). [Napo River, near Tena, Ecuador].

Genus **EUMELA**

Stal, Hemip. System., p. 559.

Key to Species

1 (2). Pronotum moderately elevated, median carina on posterior process only sometimes black, semicircular impression each side, apex about equal to tip abdomen; yellow to brownish testaceous, front patch each side, apex, and costae, brown, tegmina more or less clear ....*fornicata*

2 (1). Pronotum strongly elevated, obsoletely carinate, acute apex longer than abdomen; pale brownish yellow, large spot anteriorly, broad oblique band each side posteriorly, and costae fuscous; tegmina fuscous black, interior margins paler, body and legs yellow ....*sellata*

List of Species

fornicata Germar, Mag. Ent., IV, p. 21, (1821). [Brazil].

lacca Burmeister, Handb. Ent., II, p. 138, (1839). [Bahia, Brazil].

semiacuta Stal, Hemip. Rio. Jan., II, p. 27, (1862). (Rio Janeiro, Brazil].

sellata Germar, Rev. Ent. Silb., III, p. 234, (1835). [Brazil].

brunneo-fasciata Fairmaire, Rev. Memb., p. 292, (1846). [Brazil].

Genus **IRIA**

Stal, Bid. Hemip. Syst., p. 559.

Key to Species

1 (8). Pronotum with a strong median carina, and three short irregular or anastomosing carinae.

2 (3). Dorsal lateral carinae of pronotum continuous, undulate, one lateral carina in front of each humeral; black, carinae yellow or spotted, posterior process with subapical yellow band ....*carinata*

3 (2). Dorsal lateral carinae interrupted at middle of posterior process, destitute of carinae front of humerals.

4 (5). Blackish, white variegated, two white fasciae posteriorly; medium fascia and apical third tegmina yellow hyaline. *stictica*

5 (4). Yellow or white, tegmina hyaline.

6 (7). Testaceous yellow, an oblique subapical white band. *inornata*

7 (6). White, body, legs partly, head beneath, black; front of pronotum black variegate, dorsal spot and apex testaceous yellow, subapical black band, veins tegmina black spotted. *maculinervis*

8 (1). Pronotum with a strong median carina, and two parallel carinae each side.

9 (10). Large; fusco-ferruginous, sometimes black, yellow pubescent, front and disk pronotum paler; tegmina subhyaline, basal part opaque, veins pubescent, legs red .....*lethierryi*

10 (9). Small; blackish, sparingly pubescent, posterior process with two white bands posteriorly; tegmina fuscous black, apical part yellow hyaline, legs yellow ....*pilosella*

List of Species

carinata Walker, List Hom. Brit. Mus., p. 590, (1851). [Brazil].

stictica Stal, Hemip. Rio Jan., II, p. 26, (1862). [Rio Janeiro, Brazil].

inornata Stal, Hemip. Rio Jan., II, p. 26, (1862). [Rio Janeiro, Brazil].

maculinervis Stal, Hemip. Rio Jan., II, p. 27, (1862). [Rio Janeiro, Brazil].

lethierryi Goding, Cat. Memb. N. Am., p. 445, nom nov., (1894). *carinata* Lethierry, An. Soc. Ent. Belg., XXV, p. 15, (1872). [Guadeloupe, West Indies].

pilosella Stal, Hemip. Rio Jan., II, p. 27, (1862). [Rio Janeiro, Brazil].

fasciifera Stal, Hemip. Rio Jan., II, p. 27, (1862). [Rio Janeiro, Brazil].

Genus **RHEXIA**

Stal, Bid. Hemip. Syst., p. 560. *Scaphula* Fairmaire, Rev. Memb., p. 494 (preoccupied). *Tristan* Kirkaldy, Entomologist, XXXIV, p. 6.

Key to Species

1 (4). Pronotum without spots or stripes or bands, shining, usually with lateral impressions, finely punctulate, apical area of tegmina largely clear hyaline.

2 (3). Olivaceous yellow, basal area of tegmina concolorous. *pallescens*

3 (2). Ferruginous to piceous, basal area tegmina fuscous to black ....*semiatra*

4 (1). Pronotum with spots or stripes or bands; otherwise as in 1 (4).

5 (10). Pronotum with stripes or bands sometimes interrupted.

6 (7). Pale green, a dark brown narrow median stripe from metopidium; basal area tegmina yellowish brown, a dark apical band ....*kartabensis*

7 (6). Dorsum destitute of a median stripe.

8 (9). Testaceous, pronotum with two black streaks diverging from front margin; basal area tegmina pale brown, some transverse veins blackish ....*bistriga*

9 (8). Pale brown, lateral margins pronotum irregularly black from front of humerals nearly to apex, very broad at middle extended almost to dorsal line and enclosing two white areas; basal area tegmina black, a large discal yellow spot; chest black (Pl. XI, fig. 7) ....*biplaga*

10 (5). Pronotum with spots.

11 (14). Pronotum concolorous between humerals, shining, punctulate.

12 (13). Yellow, a subapical black spot sometimes divided; basal area tegmina brown with a short transverse black line. *flavicans*

13 (12). Black, a large yellow spot including humerals each side to basal margin, a pale green spot occupying apex; basal two-thirds tegmina black excepting extreme bases yellow, (two discoidal cells—exceptional) ....*maculata*

14 (11). Pronotum with a black or yellow spot between humerals.

15 (16). Yellow, pronotum with a large black spot between humerals sometimes reaching lateral margins; basal area tegmina, subapical spot, and line in limbus, black. *centromaculata*

16 (15). Chocolate brown, humerals, median spot between them, spot each side behind middle usually joined, yellow; basal two-thirds tegmina dark brown crossed by an oblique yellow band, a black line in limbus ....*varicosa*

List of Species

pallescens Fabricius, Syst. Rhnyg., p. 28, (1803). [South America].
alutacea Fairmaire, Rev. Memb., p. 495, (1846). [Cayenne, Dutch Guiana].

semiatra Fairmaire, Rev. Memb., p. 494, pl. 3, figs. 18-19, and pl. 7, fig. 19, (1846). [Coromandel, Brazil].
melanocephala Fowler Biol. Cen.-Am. Hom., ii, p. 83, pl. 6, fig. 15, (1895). [Bugaba, Panama].

kartabensis Haviland, Zool., vi, p. 244, pl. 2, fig. 8, (1925). [Kartabo, British Guiana].

bistriga Walker, Ins. Saund. Hom., p. 74, (1858). [Amazons, Brazil].

biplaga Walker, Jour. Ent., i, p. 318, (1862). Goding, in this paper, pl. xi, fig. 7, (1929). [Rio Janeiro, Brazil].

flavicans Fairmaire, Rev. Memb., p. 494, (1846). [Cayenne, Dutch Guiana].
cumulata Walker, List Hom. Brit. Mus. Suppl., p. 145, (1858). Goding, in this paper, pl. xi, fig. 8, (1929). [Santarem, Brazil].

maculata Funkhouser, Jour. N. Y. Ent. Soc., xxx, p. 15, pl. 2, fig. 2, (1922). [Teffe, Brazil].

centromaculata Fairmaire, Rev. Memb., p. 495, (1846). [Cayenne, Dutch Guiana].
bifasciata Butler, Cist. Ent., ii, p. 356, pl. 7, fig. 6, (1878). [Saõ Paolo Brazil].

varicosa Butler, Cist. Ent., ii, p. 356, pl. 7, fig. 5, (1878). [Ega-Teffe, Brazil].

Genus **SMILIORACHIS**

Fairmaire, Revue des Membracides, p. 290.

Key to Species

1 (4). Pronotum destitute of longitudinal lines or stripes.

2 (3). Pronotum fuscous and pale variegated, with no subapical band; tegmina yellow hyaline, basal half fuscous and pale variegated; body yellow .... *variegata*

3 (2). Pronotum testaceous yellow, not variegated, lateral margins to middle, three transverse spots at middle, subapical band, and median carina in front, white; tegmina vitreous, small spots on veins and middle of costa, fuscous black; body and legs black .... *concinna*

4 (1). Pronotum with fusco-ferruginous longitudinal lines.

5 (6). Pronotum with eight longitudinal lines, the six intermediate abbreviated in front, the two lateral ones nearly confluent anteriorly, the four middle ones extended behind to middle posterior process, and apical half of that process excepting a subapical band, fusco-ferruginous; pronotum pale yellow; tegmina vitreous, basal third, transverse band, and tips, yellow with black spots; chest black, sides yellow. *octolineata*

6 (5). Pronotum fusco-ferruginous and yellow variegated and striated, two lines each side anteriorly united in front and behind, median carina in front and some spots, subapical band, yellow; basal half tegmina and body ferruginous, margins abdominal segments yellow .... *proxima*

List of Species

ariegata Fairmaire, Rev. Memb., p. 291, (1846). [Bolivia].
oncinna Stal, Hemip. Rio Jan., II, p. 27, (1862). [Rio Janeiro, Brazil].
ctolineata Stal, Bid. Memb. Kan., p. 260, (1869). [Lagoa Santa, Brazil].
roxima Berg, Hemip. Argent. Add. et Emend., p. 154, (1884). [Uruguay].

Genus **BRACHYTALIS**

Metcalf & Bruner, Bul. Brook. Ent. Soc., XX, p. 204.

Key to Species

1 (2). Pronotum broad, depressed, shining, fuscous, broad yellow band across middle, or entirely yellow, an impressed line within basal margin pronotum; tegmina fuscous, semi-opaque; body blackish, legs fuscous .... *fuscus*

2 (1). Pronotum more depressed and slender, without impressed basal line, black, apex fuscous; tegmina entirely fuscous, abdomen blackish, segmental margins and legs reddish .... *fuscoalis*

List of Species

fuscus Metcalf and Bruner, Bul. Brook. Ent. Soc., xx, p. 204, pl. 1, figs. 7-8, (1925). [Pico Turquino, Sierra Maestra, Cuba].

fuscoalis Metcalf and Bruner, Bul. Brook. Ent. Soc., xx, p. 205, (1925). [Sierra Maestra, Cuba].

Genus **DARNOIDES**

Fairmaire, Rev. Memb., p. 495.

Key to Species

1 (4). Pronotum with yellow stripes; tegmina shining yellow.

2 (3). Black, shining; pronotum with lateral margins pale yellow abbreviated front of apex; legs brown (immature examples testaceous) .... *limbata*

3 (2). Ferruginous, shining; pronotum very convex, yellow stripe each side gradually dilated extended to middle dorsum; posterior process abruptly attenuated toward acute apex; tegmina with a black spot .... *semivitta*

4 (1). Pronotum without yellow stripes; tegmina shining yellow.

5 (6). Dorsum highly elevated; pronotum brown, shining, apex black, briefly tectiform; chest black, abdomen testaceous, legs brown (Pl. x, fig. 2) .... *brunneus*

6 (5). Dorsum lightly elevated; pronotum olivaceous, shining, apical part brown, tectiform; chest and abdomen black, legs concolorous .... *impressus*

List of Species

limbata Fairmaire, Rev. Memb., p. 495, pl. 7, figs. 15-16, (1846). [Colombia, Venezuela].

semivitta Walker, List Hom. Brit Mus., p. 586, (1851). [Colombia].

brunneus Germar, Rev. Ent. Silb., III, p. 308, (1835). [Rio Janeiro, Brazil; Pelileo, Ecuador; David, Chiriqui, Panama; Central America; Mexico].

nigro-apicata Stal, Hemip. Rio Jan., II, p. 32, (1862). [Rio Janeiro, Brazil; Dominica, West Indies].

impressus Stal, Bid. Memb. Kan., p. 262, ♂, (1869). [Bogota, Colombia].

punctellus Stal, Bid. Memb. Kan., p. 263, ♀, (1869). [Bogota, Colombia].

Note:—*Darnoides semicrema* Baker (Can. Ent., XXXIX, p. 117) is **Monobelus flavidus** Fairmaire.

Genus **PROCYRTA**

Stal, Hemip. Fabr., II, p. 32.

Key to Species

1 (2). Uniform yellow, posterior apex black, curved upward; body and legs concolorous; tegmina vitreous .... *ornamenta*

2 (1). Testaceous yellow or pale ferruginous, apex posterior process, chest, coxae, trochanters, and part hind femora, black, abdomen concolorous (♀ much larger)....*pectoralis*

List of Species

ornamenta Stoll, Cig., p. 71, pl. 18, fig. 97, (1788). [Surinam, Dutch Guiana; Napo River, Ecuador].

pectoralis Fabricius, Syst. Rhyng., p. 21, ♀, (1803). [Napo River, Ecuador].

affinis Fowler, Biol. Cen.-Am. Hom., II, p. 82, pl. 6, fig. 14, (1895). Buckton, Mon. Memb., p. 126, pl. 26, fig. 4, (1903). [Mexico; Central America; Chiriqui, Panama].

inermis Fabricius, Syst. Rhyng., p. 21, ♂, (1903). [South America].

flavescens Baker, Can. Ent., XXXIX, p. 117, (1907). [Central America].

Tribe ACONOPHORINI

Genus **KRONIDES**

Kirkaldy, Entomologist, XXXVII, p. 279. *Argante* Stal, Bid. Memb. Kan., p. 558.

Key to Species

1 (2). Robust; summit front horn with lateral margins parallel, not spatulate, median carina more elevated than lateral carinae, extreme tip convex; pronotum fuscous to piceous, tegmina concolorous, apical cells abruptly opaque yellow. *incumbens*

2 (1). Depressed; summit front horn spatulate, lateral margins sinuate, median and lateral corinae equally elevated, extreme tip sulcate; pronotum fuscous to black, tegmina concolorous, costa and narrow apical margins opaque yellow. *cochleata*

List of Species

incumbens Germar, Rev. Etn. Silb., III, p. 239, (1835). [Saõ Paulo, Saõ Leopoldo, Parana, Rio Jordaõ, Rio Grande de Sul, Brazil; Uruguay].

cochleata Schmidt, Stet. Ent. Zeit., LXXII, p. 273, (1911). [Buenos Ayres, Argentina; Montevideo, Uruguay; Rio Grande de Sul, Brazil].

tremolerasi Goding, Ent. News, XXV, p. 402, *tremolaris* in error, (1914). [Periapolis, Montevideo, Uruguay].

Genus **ACONOPHORA**

Fairmaire, Rev. Memb., p. 294.

Key to Species

1 (4). Ocelli much nearer each other than to eyes; posterior pronotal process longer than abdomen; front horn oblique.

2 (3). Testaceous or greenish; front horn strong, broad, margins parallel black margined; tegmina concolorous, tips hyaline .... *brasiliensis*

3 (2). Piceous brown; front horn small, slightly longer in ♀; tegmina fuscous, tips hyaline .... *pinguis*

4 (1). Ocelli almost equidistant, frequently slightly nearer eyes.

5 (26). Corium with all basal cells more or less distinctly punctate.

6 (13). Posterior pronotal process distinctly longer than abdomen.

7 (12). Front horn porrect, slightly ascending.

8 (11). Body dark, ferruginous to black.

9 (10). Front horn black or black margined, length variable; pronotum fuscous to black, pubescent; tegmina piceous tips pale hyaline .... *pugionata*

10 (9). Front horn concolorous, summit yellow and semitransparent, twice longer than broad at base; pronotum dark ferruginous; tegmina pale ferruginous, costa and veins brown .... *concolor*

11 (8). Body testaceous yellow; head black margins yellow; tegmina brown, tips clear hyaline; pronotum brownish testaceous .... *laminata*

12 (7). Front horn oblique, broad, thrice longer than broad at base, margins concolorous; pronotum ferruginous brown, pubescent; tegmina fuscous, pubescent, large hyaline spot on interior angle; legs ferruginous yellow .... *flavipes*

13 (6). Posterior pronotal process not or very slightly longer than abdomen.

14 (23). Pronotum produced anteriorly in a distinct horn.

15 (16). Summit front horn dilated, horn porrect, medium long; tegmina fuscous hyaline .... *tenuicorne*

16 (15). Summit front horn not dilated, sides more or less parallel.

17 (20). Pronotum not piceous or black, legs obscure.

18 (19). Front horn more or less black, four times longer than broad at base, obliquely ascending; pronotum pale ferruginous to brown, apex black; tegmina ferruginous hyaline, small fuscous apical spot .... *marginata*

19 (18). Front horn concolorous or slightly darker, almost slender, double longer than broad at base; pronotum ferruginous, apex concolorous; tegmina concolorous. .... *hastata*

20 (17). Pronotum piceous or black, shining, pubescent.

21 (22). Front horn oblique, linear, nearly long as posterior process; tegmina piceous without black markings; legs tawny .... *cultellata*

22 (21). Front horn very oblique, almost erect, short, conical, tapering, not twice longer than broad at base; tegmina testaceous yellow, costa broadly piceous with other black markings, interior third testaceous hyaline .... *variipennis*

23 (14). Pronotum angulate in front, destitute of a horn, pubescent, dorsal line straight.

24 (25). Tegmina yellowish brown; body and legs yellow, head black; pronotum broad between humerals .... *talpula*

25 (24). Tegmina hyaline, veins brown; body and legs piceous; pronotum narrow between humerals .... *imbellis*

26 (5). Corium more or less punctured at bases, second basal cell at least smooth, not punctured.

27 (40). Posterior pronotal process longer than abdomen.

28 (37). Tegmina dark testaceous or fuscous yellow.

29 (36). Corium with fuscous stripe or band or spots.

30 (35). Corium with fuscous stripe or band.

31 (34). Corium with a broad longitudinal fuscous stripe on or near costal margin; front horn strongly ascending, nearly erect.

32 (33). Front horn rather short, conical, concolorous; pronotum testaceous to piceous, densely pubescent arranged in broad longitudinal stripes or rows, fuscous stripe on corium extended from middle to tips .... *mexicana*

33 (32). Front horn long, stout, margins parallel, summit piceous; pronotum testaceous to brown, median carina and tip piceous; corium with a fuscous stripe on apical third; head black, yellow margined .... *nigricornis*

34 (31). Corium with a fuscous transverse band: pronotum brown, front horn blackish, very broad and short in ♂, longer and more slender in ♀ .... *laticornis*

35 (30). Corium with a small spot in third basal cell and apex clavus black; pronotum testaceous to black; front horn strong, porrect, slightly ascending .... *xiphias*

36 (29). Corium without spots or stripes or bands: front horn porrect, short, very broad, almost erect, concolorous brown; pronotum chocolate brown, pubescent, metopidium nearly vertical; tegmina pale brown, interior angle pale yellow hyaline .... *conifera*

37 (28). Tegmina hyaline, veins brown; pronotal front horn porrect, long as from its base to humerals.

38 (39). Dorsal line seen from side distinctly bisinuate, highest at middle; brown, ♀ testaceous posteriorly.....*fusiformis*

39 (38). Dorsal line seen from side straight; yellow-brown, sparingly and veins tegmina pubescent ....*projecta*

40 (27). Posterior pronotal process not or but slightly longer than abdomen.

41 (44). Tegmina fusco-testaceous hyaline with one or more small black spots.

42 (43). Front horn long, black, porrect, slender, summit dilated and curved upward; legs pale ferruginous. . *gracilicornis*

43 (42). Front horn concolorous, horizontal, medium broad, length variable, summit not dilated; pronotum greenish yellow, pubescent, dorsum carinate; head black margins yellow, also legs ....*grisescens*

44 (41). Tegmina hyaline without fuscous spots.

45 (48). Pronotum yellow or greenish yellow.

46 (47). Head, chest and abdomen black; front horn rather short, gradually narrowed, dorsal line straight; margins of head more or less yellow ....*femoralis*

47 (46). Head and body concolorous yellow; front horn short, porrect, dorsal line straight ....*pallescens*

48 (45). Pronotum fusco-testaceous, shining, front horn very short, conical, base broad in ♂, longer and slender in ♀, summit darker ....*disparicornis*

List of Species

brasiliensis Stal, Hem. Fabr., II, p. 34, (1896). [Rio Janeiro, Brazil].

pinguis Fowler, Biol. Cen.-Am. Hom., II, p. 64, pl. 5, fig. 11, (1895). Buckton, Mon. Memb., p. 131, pl. 27, fig 9, (1903). [Bugaba, Chiriqui, Panama; Rio Janeiro, Brazil].

pugionata Germar, Mag. Ent., IV, p. 20, (1821). [Rio Janeiro, Brzail; Ecuador; Argentina; Venezuela].

obtusa Walker, List Hom. Brit. Mus., p. 542, (1851). [Brazil].

hadina Butler, Cist. Ent., II, p. 349, pl. 7, fig. 18, (1878). [Brazil].

nitida Fowler, Biol. Cen.-Am. Hom., II, p. 66, pl. 5, fig. 12, (1895). Buckton, Mon. Memb., p. 132, pl. 28, fig. 2, (1903). [Bugaba, Chiriqui, Panama].

sinanjensis Fowler, Biol. Cen.-Am. Hom., II, p. 70, pl. 5, fig. 20, (1895). [Central America].

concolor Walker, List Hom. Brit. Mus., p. 540, (1851). [Mexico; Central America; Chiriqui, Panama].

laminata Fairmaire, Rev. Memb., p. 294, (1846). [Mexico; Guayaquil, Ecuador].

flavipes Germar, Rev. Ent. Silb., III, p. 238, (1835). Fairmaire, Rev. Memb., p. 294, pl. 7, fig. 36. Buckton, Mon. Memb., p. 128, pl. 27, fig. 2, (1903). [Brazil].

obfuscata Buckton, Trans. Ent. Soc. Lond., IX, p. 331, pl. 21, fig. 5, (1905). [Mexico].

tenuicorne Walker, Ins. Saund. Hom., p. 70, (1858). [Amazons, Brazil].

ferruginea Fowler, Biol. Cen.-Am. Hom., II, p. 69, pl. 5, fig. 16, (1895). [Bugaba, Panama; Mexico].

marginata Walker, List Hom. Brit. Mus., p. 540, (1851). Buckton, Mon. Memb., pp. 128-9, pl. 27, figs. 3-4, (1903). [Mexico; Central America; Chiriqui, Panama; Brazil; Argentina; French Guiana].

stabilis Walker, List Hom. Brit. Mus. Suppl., p. 135, (1858). [Mexico].

surgens Walker, Ins. Saund. Hom., p. 69, (1858). [South America].

spathata Butler, Cist. Ent., II, p. 34, pl. 7, fig. 16, (1878). [Brazil].

aeneosparsa Butler, Cist. Ent., II, p. 348, pl. 7, fig. 14, (1878). [Mexico].

hastata Stal, Hem. Fabr., II, p. 35, (1869). [Mexico].

nigra Stal, Hem. Fabr., II, p. 35, (1869). [Mexico].

prunitia Butler, Cist. Ent., II, p. 350, pl. 7, fig. 19, (1878). Fowler, Biol. Cen.-Am. Hom., II, p. 68, pl. 5, fig. 15, (1895). [Mexico; Peru].

cultellata Walker, Ind. Saund. Hom., p. 70, (1858). [Mexico].

variipennis Fowler, Biol. Cen.-Am. Hom., II, p. 67, pl. 5, fig. 13. [Mexico].

talpula Stoll, Cig., p. 61, pl. 15, fig. 79, (1788). [Surinam, Dutch Guiana].

subinermis Stal, Hem. Rio Jan., II, p. 28, (1862). [Rio Janeiro, Brazil].

imbellis Fairmaire, Rev. Memb., p. 295, (1846). [Brazil].

minuta Fowler, Biol. Cen.-Am. Hom., II, p. 72, (1895). [Mexico].

mexicana Stal, Stet. Ent. Zeit., XXV, p. 70, (1864). Fowler, Biol. Cen.-Am. Hom., II, p. 62, pl. 5, fig. 8, (1895). Buckton, Mon. Memb., p. 128, pl. 26, figs. 7-8, (1903). [Mexico; Central America; Chiriqui, Panama; Colombia; Baños, Colimes, Narangapata, Ecuador].

nigricornis Fowler, Biol. Cen.-Am. Hom., II, p. 64, pl. 5, fig. 10, (1895). [Mexico; Central America; Pelileo, Baños, Biblian, Loja, Ecuador].

laticorne Walker, List Hom. Brit. Mus. Suppl., p. 134, (1858). Buckton, Mon. Memb., p. 129, pl. 27, figs. 5-6, (1903). [Mexico; Central America; Ecuador].

xiphias Fabricius, Syst. Rhyng., p. 12, (1803). [Baños, Ecuador].

teligera Germar, Mag. Ent., IV, p. 21, (1821). [Brazil].

conifera Butler, Cist. Ent., II, p. 350, pl. 7, fig. 17, (1878). [Mexico].

fusiformis Fowler, Biol. Cen.-Am. Hom., II, p. 69, pl. 5, figs. 18-19, (1895). [Chiriqui, Panama].

projecta Funkhouser, Jour. N. Y. Ent. Soc., XXXV, p. 160, pl. 17, fig. 2, (1927). [Cochabamba, Bolivia].

gracilicornis Stal, Hem. Fabr., II, p. 35, (1869). [Mexico].

ensata Fowler, Biol. Cen.-Am. Hom., II, p. 68, pl. 5, fig. 14, (1895). Buckton, Mon. Memb., p. 131, pl. 27, fig. 10, (1903). [Mexico; Central America; Bugaba, Chiriqui, Panama].

grisescens Germar, Rev. Ent. Silb., III, p. 238, (1835). [Rio Janeiro, Brazil].

pugnax Germar, Rev. Ent. Silb., III, p. 239, (1835). [Brazil].

gilvipes Stal, Hem. Rio Jan., II, p. 28, (1862). [Rio Janeiro, Brazil].

femoralis Stal, Hem. Fabr., II, p. 35, (1869). Fowler, Biol. Cen.-Am. Hom., II, p. 70, pl. 5, fig. 22, 1895). [Mexico; Huigra, Ecuador].

pallescens Stal, Hem. Fabr., II, p. 35, (1869). Fowler, Biol. Cen.-Am. Hom., II, p. 71, pl. 5, fig. 23, (1895). [Mexico; Central America].

gladiata Stal, Hem. Fabr., II, p. 35, (1869). [Mexico].

viridula Fowler, Biol. Cen.-Am. Hom., II, p. 71, (1895). Buckton, Mon. Memb., p. 130, pl. 27, fig. 8, (1903). [Mexico].

disparicornis Fowler, Biol. Cen.-Am. Hom., II, p. 69, pl. 5, fig. 17, (1895). Buckton, Mon. Memb., p. 131, pl. 28, fig. 1, (1895). [Chiriqui, Panama].

obtusiuscula Fowler, Biol. Cen.-Am. Hom., II, p. 71, (1895). [Mexico].

Note: Mexican and Central American species have been included, as it is probable that eventually they will be taken in South Amrica, or identified with previously described forms.

Tribe HEMIKYPTHINI

Genus **PROTERPIA**

Stal, Bid. Memb. Kan., p. 557.

Key to Species

One grayish yellow species with indistinct gray points, with the suprahumerals compressed, directed forward, and rounded at summits; free part of tegmina yellow pubescent. *rotundicornis*

List of Species

rotundicornis Fairmaire, Rev. Memb., p. 314, pl. 6, fig. 25. [Brazil; Venezuela].

Genus **EUALTHE**

Stal, Bid. Hem. Syst., p. 559.

Key to Species

1 (2). Suprahumerals very short, length and breadth at base subequal, horizontal, summits obtuse; shining brown, tips of horns and of posterior process black, apex longer than tegmina .... *laevigata*

2 (1). Suprahumerals horizontal, strong, much longer than broad as bases; yellow, black punctured, a line below horns, small spot each side, and tip of apex, black ...... *punctum*

List of Species

laevigata Fairmaire, Rev. Memb., p. 318, (1846). [Brazil].

longa Walker, List Hom. Brit. Mus., p. 570, (1851). [Brazil].

attenuata Walker, List Hom. Brit. Mus. Suppl., p. 144, (1858). [Brazil].

punctum Fairmaire, Rev. Memb., p. 318, pl. 6, fig. 22, (1846). [Brazil].

Genus NASSUNIA

Stal, Hemip. Rio Janeiro, II, p. 30.

Key to Species

1 (4). Pronotum tawny without black or brown forked dorsal stripe; median carina obsolete anteriorly; horns horizontal.

2 (3). Posterior pronotal process with dorsal carina and spot each side black; horns short, acute, tips black........*fortis*

3 (2). Posterior process testaceous, a tawny oblique stripe each side; horns longer, lightly recurved ....*conficita*

4 (1). Pronotum greenish or yellowish gray with a brown or black stripe on dorsum forked anteriorly, each ramus extended to behind eye.

5 (12). Suprahumerals brown or black.

6 (7). Posterior process with a black spot each side, apical half brown; tips of horns black, an oblong fuscous subapical spot on costa ....*dalmani*

7 (6). Posterior process without lateral black spots.

8 (11). Pronotum black punctured anteriorly.

9 (10). Posterior process with a subapical black band....*trux*

10 (9). Posterior process without a subapical black band. *gentilis*

11 (8). Pronotum with concolorous punctures, yellowish gray, tip brown; tegmina yellowish hyaline, small brown spot exteriorly ....*bipunctata*

12 (5). Suprahumerals concolorous grayish yellow, dorsal stripe reddish, sides abdomen black; tegmina vitreous, veins red ....*binotata*

List of Species

fortis Walker, List Hom. Brit. Mus. Suppl., p. 132, (1858). [Tejuca, Brazil; Napo River, Ecuador].

bistillata Stal, Hem. Rio Jan., II, p. 31, (1862). [Rio Janeiro, Brazil].

conficita Walker, List Hom. Brit. Mus. Suppl., p. 139, (1858). [Rio Negro, Brazil].

dalmani Stal, Hem. Rio Jan., II, p. 31, (1862). [Rio Janeiro, Brazil].

trux Breddin, Soc. Ent., XVI, p. 178, (1902). [Ecuador].

gentilis Breddin, Soc. Ent., XVI, p. 178, (1902). [South America].

nigrofasciata Funkhouser, Jour. N. Y. Ent. Soc., XXX, p. 13, pl. 1, figs. 11-12, (1922). [Iquitos, Peru].

bipunctata Fairmaire, Rev. Memb., p. 290, ♀, (1846). [Brazil].

bispina Fairmaire, Rev. Memb., p. 290, ♂, (1846). Fowler, Biol. Cen.-Am. Hom., II, p. 80, pl. 6, fig. 12, (1895). [Bugaba, Panama; Colombia].

binotata Fairmaire, Rev. Memb., p. 291, (1846). [Brazil].

Genus **TOMOGONIA**

Stal, Bidrag Memb. Kan., p. 258.

Key to Species

1 (4). Pronotum yellow without black stripes.

2 (3). Tegmina yellow hyaline, a black stripe along costal margin, radial and first ulnar veins approaching; pronotum pubescent anteriorly, a small black spot each side posteriorly; body and legs concolorous .... *vittatipennis*

3 (2). Tegmina shining yellow with a fuscous apical band; radial and ulnar veins distant; pronotum immaculate yellow, shining, not pubescent, chest, tip abdomen and front tarsi black .... *pectoralis*

4 (1). Pronotum shining yellow, two spots above each eye, broad stripe each side of suprahumerals, median dorsal carina from summit metopidium and apical half posterior process, shining black, lateral margins broadly white on anterior half; all margins tegmina broadly brown, large anterior area and narrow costal spot clear hyaline; body and legs yellow, tips tarsi piceous .... *camposiana*

List of Species

vittatipennis Fairmaire, Rev. Memb., p. 293, pl. 5, fig. 3, (1846). Fowler, Biol. Cen.-Am. Hom., II, p. 79, pl. 6, fig. 10, (1895). [Central America].

pectoralis Stal, Bid. Memb. Kan., p. 259, (1869). [Bogota, Colombia].

camposiana Goding, Bol. Med. Cir. Guay., XVIII, p. 36, pl. 1, fig. 2, (1920), and Memb. Ecuad., p. 248, pl. 1, fig. 2, (1920). [Posorja, Ecuador].

Genus **CALLICENTRUS**

Stal, Bidrag Memb. Kan., p. 290. *Pyramba* Buckton, Mon. Memb., p. 248.

Key to Species

1 (8). Head transverse, broader than long.

2 (7). Suprahumerals some longer than breadth between them, acuminate summits acute.

3 (4). Posterior process shorter than abdomen; pronotum shining black, lateral margins with or without yellow stripe behind humerals, base with or without transverse yellow band. *flavivitta*

4 (3). Posterior process long as tegmina; pronotum orange yellow in front extended on dorsum interrupted by a black band between suprahumerals, a gray patch above each humeral; tegmina hyaline .... *aurifacies*

7 (2). Suprahumerals three times longer than breadth between them, blue, tips truncate, broadened and acute behind; pronotum blue, posterior process keeled, curved, lateral margins yellow, apex passing tip of abdomen, chest, abdomen and legs red; tegmina black, veins blue.....*ignipes*

8 (1). Head triangular; pronotum testaceous or ferruginous, slightly pubescent, horns sometimes piceous about as long as breadth between them; posterior process long as abdomen, dorsum undulate, apex ferruginous or piceous, lateral margins more or less distinctly yellow; tegmina ferruginous. *cribratus*

List of Species

flavitta Walker, List Hom. Brit. Mus., p. 617, ♂, (1851). [Cinchona, Jamaica; Port-au-Prince, Haiti].

aurifascia Walker, List Hom. Brit. Mus., p. 618, ♂♀, (1851). [Jamaica].

platycerus Walker, List Hom. Brit. Mus., p. 618, ♀, (1851). (Jamaica].

aurifacies Buckton, Mon. Memb., p. 248, pl. 58, fig. 5, (1903). [Jamaica].

ignipes Walker, List Hom. Brit. Mus., p. 616, (1851). [Jamaica].

cribratus Walker, List Hom. Brit. Mus., p. 619, ♀, (1851). [Jamaica].

jucundus Walker, List Hom. Brit. Mus., p. 620, ♂, (1851). [Jamaica].

Genus **ALCMEONE**

Stal, Bidrag Hemip, Syst., p. 558.

Key to Species

1 (8). Suprahumerals horizontal, broad, sides parallel.

2 (7). Summits suprahumerals abruptly narrowed and acute, dorsum convex, highest behind humerals then depressed; pronotum shining black or piceous, tegmina blackish.

3 (6). Head triangular, slightly longer than broad, pale, fuscous.

4 (5). Lateral margins posterior process, chest and legs yellowish; tegmina pale fuscous hyaline, tips blackish pale bimaculate ....*curvicornis*

5 (4). Shining black, median yellow stripe on head, base of median carina indistinctly testaceous, short yellow stripe on bases tegmina; legs testaceous outer surface black. *unistriga*

6 (3). Head transverse, short; pronotum dotted with yellow. *lata*

7 (2). Summits suprahumerals truncate, excavated; pronotum testaceous brown, a black band common to both horns; chest black, abdomen and legs testaceous; tegmina yellow hyaline with a darker longitudinal stripe ....*expansicornis*

8 (1). Suprahumerals gradually acuminate from bases.

9 (14). Basal margin of head arcuate or sinuate.

10 (13). Dorsum highest behind humerals.

11 (12). Pronotum immaculate piceous black; tegmina blackish. *brevis*

12 (11). Pronotum reddish to piceous, head, suprahumerals beneath, and metopidium spotted with yellow, a short yellow stripe behind humerals; tegmina shining yellow.....*picea*

13 (10). Dorsum highest between humerals; head and pronotum scarlet, dorsum interrupted by a scarlet line on median carina, suprehumerals and line beneath to each humeral, small spot each side, and apex black; tegmina fuscous. *godmani*

14 (9). Basal margin of head straight; dark yellow, dorsum darker sometimes occupying large part of pronotum in that case with two oblique yellow bands, horns shining black; tegmina yellow hyaline, costal margins and tips blackish. *centrotoides*

List of Species

curvicornis Stal, Bid. Memb. Kan., p. 256, (1896). [Cayenne, Dutch Guiana].

unistriga Goding, Trans. Am. Ent. Soc., LII, p. 107, (1926). [Napo River, Ecuador].

lata Walker, List Hom. Brit. Mus., p. 571, (1851). [Unknown].

expansicornis Fairmaire, Rev. Memb., p. 317, (1846). [Brazil].

brevis Walker, List Hom. Brit. Mus., p. 571, pl. 4, fig. 13, (1851). [Brazil].

picea Fairmaire, Rev. Memb., p. 316, (1846). [Brazil].

caseosculpis Butler, Cist. Ent., II, p. 344, (1878). [Unknown].

godmani Fowler, Biol. Cen.-Am. Hom., II, p. 72, pl. 5, fig. 24, (1895). [Mexico].

centrotoides Fairmaire, Rev. Memb., p. 317, (1846). Buckton, Mon. Memb., p. 110, pl. 24, fig. 6, (1903). [Brazil].

Genus **HYPHINOE**

Stal, Bidrag Hemip. Syst., p. 558; *Ictaranthe* Fowler, Biol. Cen.-Am. Hom., II, p. 79. *Tauriona* Buckton, Mon. Memb., p. 259. *Trapezoida* Buckton, Trans. Linn. Soc. Lond., IX, p. 335.

Key to Species

1 (6). Lateral margins pronotum distinctly yellow, convex between tips of suprahumerals.

2 (5). Dorsum more or less abruptly declivous behind humerals; lateral yellow stripe extended from apex suprahumerals almost to posterior apex; tegmina concolorous.

3 (4). Declivity on dorsum just behind suprahumerals; brown, apex black ....*marginalis*

4 (3). Declivity on dorsum at middle; pronotum brown, black punctured, spot behind each suprahumeral, another each side behind, tips suprahumerals and posterior apex, black. *yaguachiensis*

5 (2). Dorsum gradually decreasing in altitude from between suprahumerals to posterior apex; alive brown, spot behind each suprahumeral, another each side posteriorly, tips suprahumerals posterior apex, black ....*purulensis*

6 (1). Lateral margins pronotum concolorous.

7 (20). Pronotum seen from front convex between summits suprahumerals.

8 (13). Sides pronotum simply angulate above humerals, not cornute.

9 (12). Dorsum more or less abruptly declivous at middle; piceous to black, or dark brown, with long gray hairs.

10 (11). Ocelli on a line with center of eyes ....*inermis*

11 (10). Ocelli on a line with upper margin of eyes:

a. Dorsum distinctly declivous at middle..form *asphaltina*

aa. Dorsum not distinctly declivous at middle...form *morio*

12 (9). Dorsum abruptly declivous just behind suprahumerals; yellow, body dark, tips and band beneath suprahumerals, and posterior apex which extends to tips tegmina, black. *ochracea*

13 (8). Pronotum produced above each humeral in a distinct horn variable in length but rather short.

14 (15). Pronotum piceous, head, rather prominent horns, and posterior apex black ....*diabolica*

15 (14). Pronotum yellow to cinnamon red; posterior process with spot each side and horns black.

16 (17). Dorsal carina ferruginous or red ....*placida*

17 (16). Dorsal carina concolorous.

18 (19). Suprahumerals black from tips to humerals....*bigutta*

19 (18). Suprahumerals concolorous, short, conical; tegmina and body brown ....*camelus*

20 (7). Pronotum seen from front concave or flat between suprahumerals; suprahumerals two to four times longer than broad at bases.

21 (24). Suprahumerals four times long as broad, extended strongly upward, outward, slightly recurved.

22 (23). Dorsum straight, apex almost long as tegmina; piceous-brown, large spot each side metopidium and behind humerals yellow ....*obesum*

23 (22). Dorsum sinuate behind middle, apex shorter than tegmina; pronotum immaculate brown ....*vulpecula*

24 (21). Suprahumerals not more than twice longer than broad at bases; dorsum gradually declivous from behind humerals, sometimes lightly elevated near middle; frequently a black spot each side.

25 (26). Suprahumerals extended strongly upward and outward, concave between; pronotum olivaceous-yellow, lateral and upper margins suprahumerals castenous, tips horns and posterior apex black ....*cornuta*

26 (25). Suprahumerals almost horizontal.

27 (28). Dorsum straight to apex; cinnamon-brown, dark spot near interior angle tegmina ....*quadrimaculata*

28 (27). Dorsum seen from side convex near middle.

28 (29). Pronotum testaceous, tips and band below suprahumerals to humerals and posterior apex black, not decurved; sides behind humerals pale and impressed; tegmina hyaline, subapical fuscous spot ....*latifrons*

29 (28). Pronotum dark fuscous, band from tips suprahumerals to humerals, median and subapical transverse bands, yellow; tegmina dark brown, subopaque; metopidium hirsute, posterior apex decurved ....*hirsuta*

List of Species

marginalis Fallou, Rev. Ent., IX, p. 353, (1890). Fowler, Biol. Cen.-Am. Hom., II, p. 75, pl. 5, fig. 25, (1895). Buckton, Mon. Memb., p. 120, pl. 25, fig. 1, (1903). [Central America; Ecuador].

yaguachiensis Goding, Jour. N. Y. Ent. Soc., XXXVII, p. 11. [Yaguachi, Ecuador].

purulensis Fowler, Biol. Cen.-Am. Hom., II, p. 77, pl. 6, figs. 4-5, (1895). Buckton, Mon. Memb., p. 123, pl. 26, figs. 2 and 6, (1903). [Central America; Ecuador].

inermis Goding, Trans. Am. Ent. Soc., LII, p. 107, (1926). [Posorja, Ecuador].

asphaltina Fairmaire, Rev. Memb., p. 319, pl. 6, fig. 20, (1846). Buckton, Mon. Memb., p. 120, pl. 25, fig. 2, (1903). [Mexico; Central America; Chiriqui, Bocas Guabita, Panama; Venezuela; Bogota, Colombia; Baños, Guayaquil, Posorja, Ecuador].

apriformis Walker, List Hom. Brit. Mus. Suppl., p. 144, (1858). [Mexico].

pubescens Walker, List Hom. Brit. Mus. Suppl., p. 144, (1858). [Mexico].

morio Stal, Bid. Memb. Kan., p. 257, (1869). [Bogota, Colombia].

ochracea Fowler, Biol. Cen.-Am. Hom., II, p. 78, pl. 6, fig. 8, (1895). [Central America].

diabolica Butler, Cist. Ent., II, p. 346, (1878). [Unknown].

placida Germar, Rev. Ent. Silb., III, p. 246, (1835). [Brazil; Central America].

valida Walker, List Hom. Brit. Mus., p. 524, (1851). [Mexico].

viridissima Walker, List Hom. Brit. Mus., p. 572, (1851).

bigutta Walker, List Hom. Brit. Mus. Suppl., p. 142, (1858). Fowler, Biol. Cen.-Am. Hom., II, p. 78, pl. 6, fig. 7, (1895). Buckton, Mon. Memb., p. 123, pl. 26, fig. 1, (1903). [Central America].

obliqua Walker, Ins. Saund. Hom., p. 73, (1858). [Mexico].

tau Fowler, Biol. Cen.-Am. Hom., II, p. 76, pl. 6, fig. 1, (1895). Buckton, Mon. Memb., p. 122, pl. 25, fig. 5, (1903). [Chiriqui, Panama].

atitlanta Fowler, Biol. Cen.-Am. Hom., II, p. 76, pl. 6. fig. 2, (1895). Central America].

camelus Gray, An. King. Ins., II, p. 260, pl. 106, fig. 3, (1832). Fairmaire, Rev. Memb., p. 319, pl. 6, fig. 21, (1846). [Mexico].

sagata Germar, Rev. Ent. Silb., III, p. 245, (1835). [Mexico].

cuneata Germar, Rev. Ent. Silb., III, p. 246, (1835). Fairmaire, Rev. Memb., p. 319, pl. 6, fig. 20, (1846). [Mexico].

globiceps Fairmaire, Rev. Memb., p. 319, pl. 6, fig. 19, (1846). Buckton, Mon. Memb., p. 122, pl. 25, fig. 4, (1903). [Mexico].

obesum Buckton, Mon. Memb., p. 259, pl. 60, fig. 9, (1903). Goding, Jour. N. Y. Ent. Soc., XXXVI, pl. 8, figs. 14-15, (1928). [Paramba, Ecuador].

vulpecula Fowler, Biol. Cen.-Am. Hom., II, p. 77, pl. 6, fig. 6, (1895). [Chiriqui, Panama].

cornuta Distant, Ent. Mo. Mag., XVI, p. 12, (1879). Fowler, Biol. Cen.-Am. Hom., II, p. 76, pl. 6, fig. 3, (1895). [Central America; Panama].

proclivus Distant, Trans. Ent. Soc. Lond., IV, p. 695, (1900). [Central America].

thoracata Distant, Trans. Ent. Soc. Lond., IV, p. 695, (1900). [Central America].

quadrimaculata Buckton, Mon. Memb., p. 121, pl. 25, fig. 3, (1903). [Brazil].

latifrons Fowler, Biol. Cen.-Am. Hom., II, p. 79, pl. 6, fig. 9, (1895). [Bugaba, Panama].

hirsuta Buckton, Trans. Ent. Soc. Lond., IX, p. 335, pl. 22, fig. 11. [Central America].

Note: Mexican and Central American species are included as doubtless they will be taken in Panama and South America.

Genus **BUBALOPA**

Stal, Bidrag Memb. Kan., p. 255.

Key to Species

1 (4). Dorsum straight from between humerals to posterior apex, horns acuminate, obliquely directed outward and strongly upward, slightly forward.

2 (3). Olivaceous yellow, legs dark yellow; tegmina brown, exterior vein yellow .... *furcata*

3 (2). Yellow, posterior process with spot and numerous dots each side black; tegmina gray, venation yellow, legs pale. *punctorum*

4 (1). Dorsum lightly sinuate behind middle, posterior process slightly elevated at base in an obscure angle; pale yellow, black punctured anteriorly, horns and oblique band beneath ferruginous, tips black; tegmina ferruginous hyaline, two exterior basal cells fuscous punctate beyond middle, veins punctate each side, spot behind apex clavus and oblong spot on exterior apical angle dark fuscous. *obscuricornis*

List of Species

furcata Fairmaire, Rev. Memb., p. 314, (1846). [Bogota, Colombia].

punctorum Buckton, Mon. Memb., p. 124, pl. 28, fig. 3, (1903). [Rio Janeiro, Brazil].

obscuricornis Stal, Bid. Memb. Kan., p. 256, (1869). [Bogota, Colombia].

Genus **SUNDARION**

Kirkaldy, Entomologist, xxxvii, p. 279. *Pyranthe* Stal, Bid. Hem. Syst., p. 558.

Key to Species

1 (4). Suprahumerals very broad, tips truncate, hind angles acute, front angles rounded; yellow, usually fusco-variagate, chest black.

2 (3). Dorsum pronotum gradually descending to apex; yellow to testaceous, colors variable, often a black dot behind each side, tips horns and of posterior apex, black; horns nearly horizontal .... *bimaculata*

3 (2). Dorsum pronotum tumescent front of middle, abruptly and obliquely declivous behind middle, horns directed upward and slightly outward; ferruginous yellow, horns, median stripe to posterior apex fuscous .... *auriculata*

4 (1). Suprahumerals very broad at bases, gradually acuminate, tips acute.

5 (6). Lateral margins posterior process yellow; yellow to piceous, usually yellow or yellow irrorate, when yellow horns, tip posterior process and small spot each side, black; small .... *xanthographa*

6 (5). Lateral margins posterior process concolorous; yellow to pale ferruginous; horns flat.

7 (8). Horns very long which sometimes, with small spot each side posterior process, black; size large .... *flava*

8 (7). Horns medium, sometimes with spot each side posteriorly, and horns, black; size medium .... *apicalis*

List of Species

imaculata Fairmaire, Rev. Memb., p. 315, (1846). [Brazil].

alata Fairmaire, Rev. Memb., p. 317, pl. 6, fig. 24, (1846). [Brazil].

laticornis Stal, Bid. Memb. Kan., p. 254, (1869). [Rio Janeiro, Brazil].

uriculata Stal, Bid. Memb. Kan., p. 254, (1869). [Saõ Paulo, Brazil].

anthographa Germar, Rev. Ent. Silb., III, p. 237, (1835). [Brazil].

flavomarginata Fairmaire, Rev. Memb., p. 315, (1846). [Brazil].

chilensis Blanchard, Hist. Chile, Gay, Zool., VII, p. 270, pl. 3, fig. 6, (1852). [Chile; Mendoza, Argentina].

frustratoria Berg, Hem. Argent., p. 296, (1879). [Tucuman, Argentina; Canquennes, Maule, Chile].

flava Fairmaire, Rev. Memb., p. 314, (1846). Buckton, Mon. Memb., p. 137, pl. 29, fig. 4, (1903). [Rio Janeiro, Brazil].

longicornis Fairmaire, Rev. Memb., p. 315. [? North America].

apicalis Walker, List Hom. Brit. Mus., p. 572. [Unknown].

apicalis Germar, Rev. Ent. Silb., III, p. 236, (1835). [Brazil; Montevideo, Uruguay].

brunniventris Fairmaire, Rev. Memb. Silb. IIIV, p. 316, (1825). [Brazil].

acaciae Berg, Hem. Argent. Add. y Emend., p. 152, (1884). [Brazil; Uruguay].

Genus **HEMIKYPTHA**

Metcalf Ent. News, XXXVIII, p. 16; (*Hemiptycha* of authors).

Key to Species

1 (4). Lateral margins pronotum yellow; pronotum brown to black, sprinkled with yellow and white; dorsum gradually descending to apex.

2 (3). Suprahumerals very long, moderately stout, tips slightly dilated; pronotum fusco-testaceous to black .... *crux*

3 (2). Suprahumerals rather slender, gradually acuminate, tips acute .... *marginata*

4 (1). Lateral margins pronotum concolorous, pronotum testaceous to black.

5 (8). Dorsum gradually decreasing in altitude to apex, horns strong, margins nearly parallel; pronotum testaceous to black, sprinkled with yellow or fuscous.

6 (7). Summits of horns truncate, black; pronotum testaceous, spot each side posteriorly and median dorsal stripe black; posterior apex slightly longer than abdomen. *compressicornis*

7 (6). Summits of horns acute, horns slender, acuminate, posterior apex long as or longer than tegmina; pronotum brown black with numerous yellow dots ....*punctata*

8 (5). Dorsum abruptly and obliquely declivous behind middle, horns long, slender, acuminate; pronotum reddish to black sprinkled with yellow; posterior apex longer than tegmina ....*scutelligera*

List of Species

crux Linnaeus, Syst. Nat. I, p. 435, (1758). [America fide Olivier].
spatulosa Buckton, Mon. Memb., p. 137, pl. 29, fig. 3, (1903). [Brazil].
marginata Fabricius Ent. Syst., IV, p. 12, (1775). Fairmaire, Rev. Memb., p. 312, pl. 6, figs. 16-17, (1846). [Brazil; Cayenne, Dutch Guiana].
sinepsis Linnaeus, Syst. Nat., II, p. 2095, (1788). [Brazil].
nigrotaurus Stoll, Cig., p. 49, pl. 11, fig. 53, (1788). [Cayenne, Dutch Guiana].
compressicornis Fairmaire, Rev. Memb., p. 313, pl. 6, fig. 18, (1846). [Bahia, Brazil].
truncaticornis Walker, Ins. Saund. Hom., p. 73, (1858). [Brazil].
punctata Fabricius, Ent. Syst., IV, p. 13, (1775). [Brazil].
braziliensis Fabricius, Syst. Ent., p. 676, (1775). [Brazil].
maculitaurus Stoll, Cig., p. 68, pl. 17, fig. 91, (1788). [Brazil].
maculata Olivier, Enc. Meth., VII, p. 668, (1792). [Brazil].
cervus Germar, Rev. Ent. Silb., III, p. 247, (1835). [Brazil].
scutelligera Lesson, Ills. Zool., pl. 55, fig. 2, (1831). [Brazil].
sarcinata Stal, Bid. Memb. Kan., p. 251, (1869). [Bahia, Brazil; Normandie, Ecuador].
marginata Buckton, Mon. Memb., p. 136, pl. 29, fig. 2, (1903). [Brazil; Cayenne, Dutch Guiana].

Tribe HETERONOTINI

Genus **HELIODORE**

Stal, Bidrag Memb. Kan., p. 559.

Key to Species

1 (4). Lateral carinae extended from base pronotum uniting on middle of dorsum.

2 (3). Pronotum black, large yellow spot on dorsum limited by lateral carinae; spines straight, yellow; tegmina pale yellow hyaline, tips darker; body and legs yellow..*carinata*

3 (2). Pronotum ferruginous black variegated, three black-margined white patches each side, a white subapical band; lateral spines curved; tegmina clear hyaline, median black stripe front of middle; legs black, tarsi yellow, tips black. *incongrua*

4 (1). Lateral carinae extended from base pronotum uniting at summit of metopidium; pronotum pale fuscous and yellow irrorate, dorsum darker, terminal spine white tip black; terminal spine longest with median white band.....*laporti*

List of Species

carinata Guerin, Icon. Reg. An., III, p. 366, (1838). [Brazil].

incongrua Walker, List Hom. Brit. Mus. Suppl., p. 340, (1858). [Tunantins, Brazil].

laporti Germar, Rev. Ent. Silb., III, p. 253, (1835). Buckton, Mon. Memb., p. 146, pl. 31, fig. 3, and pl. 32, figs. 1 and 3, (1903). [Rio Janeiro, Brazil; Cayenne, Dutch Guiana].

Genus **OMOLON**

Walker, Journal Entomology, I, p. 315.

Key to Species

1 (2). Yellow, a median and two white stripes each side united behind, a looped spot behind each pair, black; spines black, terminal spine longest with median white band (pl. x, fig. 5) *tridens*

2 (1). Black, with numerous white dots some confluent, two large spots each side behind, and median band on terminal spine white ....*varius*

List of Species

tridens Walker, Jour. Ent., I, p. 316, pl. 15, fig. 1, (1862). Buckton, Mon. Memb., p. 146, pl. 31, fig. 5, (1903). [Para, Amazons, Brazil].

varius Walker, Jour. Ent., I, p. 316, (1862). [Para, Brazil].

Genus **ANCHISTROTUS**

Buckton, Mon. Memb., p. 147. *Combophora* Germar, Rev. Ent. Silb., I, p. 171.

Key to Species

1 (6). Pronotum fusco-yellow variegated, destitute of large spots or stripes.

2 (3). Sides of pronotal swelling extended far beyond margins abdomen, posterior spines yellow ....*obesus*

3 (2). Sides of pronotal swelling slightly extended beyond margins abdomen.

4 (5). Posterior pronotal spines yellow ....*maculatus*

5 (4). Posterior spines yellow, base apical spine black. *consentaneus*

6 (1). Pronotum with stripes, bands or large spots.

7 (10). Pronotum fuscous.

8 (9). Sides pronotum from antero-lateral angles to margins behind humeral sinus narrowly, interrupted median fascia, pale yellow ....*inanis*

9 (8). Pronotum with stripe each side from base to broad transverse band posteriorly, band behind humerals across dorsum not reaching lateral margins, and posterior marginal band including fuscous-banded apical spine, pale yellow ....*bucktoni*

10 (7). Pronotum rose-red, black punctate, median carina, stripe each side, one or more large lateral spots, irregular transverse band behind including lateral spines, and base apical spine, black ....*beskii*

List of Species

obesus Buckton, Mon. Memb., p. 147, pl. 31, fig. 4, and pl. 32, figs. 2 and 7, (1903). [Amazons, Brazil].

maculatus Guerin, Icon. Reg. An., III, p. 366, (1838). [Bolivia; Brazil; Colombia; Napo River, Ecuador].

discontinua Walker, List Hom. Brit. Mus. Suppl., p. 157, (1858). [Ega, Brazil].

obfuscata Buckton, Mon. Memb., p. 147, pl. 31, fig. 7, and pl. 32, fig. 6, (1903). [Amazons, Brazil].

consentaneus Fairmaire, Rev. Memb., p. 505, (1846). Walker, List Hom. Brit. Mus., p. 599, pl. 4, fig. 14, (1851). Buckton, Mon. Memb., p. 146, pl. 31, fig. 6, and pl. 32, fig. 4, (1903). [Ega, Brazil].

minor Fairmaire, Rev. Memb., p. 505, (1846). [Brazil].

inanis Fabricius, Syst. Rhyng., p. 6, (1803). [South America].

bucktoni Goding, Jour. N. Y. Ent. Soc., XXXVII, p. 12. [Amazons, Brazil].

beskii Buckton, Mon. Memb., p. 145, pl. 31, fig. 2, (1903). [Amazons, Brazil].

beskii Germar, Rev. Ent., I, p. 232, pl. 12, figs. A-E, (1833). Mann, Psyche, XIX, p. 146, pl. 12, figs. 1-4, (1912). Buckton, Mon. Memb., p. 145, pl. 31, fig. 1, (1903). [Porto Velho, Rio Madeira, Amazons, Brazil].

cucullata Perty, Del. An. Art., p. 178, pl. 35, fig. 9, (1834). [Brazil].

Genus **HETERONOTUS**

Laporte, Ann. Soc. Ent. Fr., I, p. 95. *Heniconotus* Stal, Bidrag Hemip. Syst., p. 560. *Ernestopehlkia* Schmidt, Ent. Mitt., XIII, p. 295.

Key to Species

1 (4). Apex posterior pronotal process destitute of lateral spines; ♀ with suprahumeral spine each side, ♂ usually unarmed above humerals.

2 (3). Terminal node posterior pronotal process destitute of spine beneath; posterior process much longer than tegmina, slender cylindrical, apex inflated and areolate; pronotum tawny or green to fuscous with five white stripes, inner pair abbreviated ....*delineatus*

3 (2). Terminal node posterior process with a strong spine beneath, some longer than tegmina; pronotum brown to black, margins and mark each side of nodes white; distinctly binodose posteriorly ....*glanduliger*

4 (1). Apex posterior pronotal process with a spine each side and one beneath posteriorly; ♀ with two suprahumeral spines, ♂ usually unarmed above humerals.

5 (18). Posterior pronotal process binodose.

6 (9). Tegmina shorter than posterior process.

7 (8). Second node posterior process larger, apical spines long with yellow band; pronotum ferruginous, four black stripes united at base, sides yellow, suprahumerals black...*abcisus*

8 (7). Nodes posterior process subequal, large, basal node oval, second node globose; pronotum fusco-ferruginous, smooth above, lateral margins, and spot each side first node, yellow. *bulliferus*

9 (6). Tegmina subequal or longer than posterior process.

10 (11). Tegmina and posterior process subequal, pronotum piceous to black, front margin, arcuate front band, white; nodes connected by a short petiole, lateral apical spines white, bases black ....*leucotelus*

11 (10). Tegmina longer than posterior process.

12 (13). Apical node roughly areolated; pronotum ferruginous, strongly punctured, five longitudinal stripes inner pair shortest, tips apical spines, white; nodes separated by a distinct petiole, white spot each side ....*stipatus*

13 (12). Apical node not roughly areolated.

14 (15). Pronotum destitute of longitudinal stripes its disk, disk first node, and second node, black ....*armatus*

15 (14). Pronotum with longitudinal stripes.

16 (17). Petiole rather long between nodes; pronotum yellow, smooth, dorsal spines and four irregular stripes, base and band on posterior apex, black, apical spines yellow. .*divisus*

17 (16). Petiole short between nodes; pronotum ferruginous, margins, three discal lines, band each side of nodes, and apical spines white .... *abbreviatus*

18 (5). Posterior pronotal process tri- or quadrinodose.

19 (46). Pronotum trinodose posteriorly, seen from side first node sometimes represented by a small tubercle only, or apical node elongate and slightly constricted at base indicating a third node.

20 (37). Posterior process seen from side when first node represented by a small tubercle or apical node constricted and elongate.

21 (34). First node represented by a small tubercle.

22 (25). Tegmina and posterior process including terminal spine subequal.

23 (24). Terminal node much the largest its spine beneath short not passing hind margin of node, petiole long as diameter of node; pronotum black, lateral margins, curved front line, and band on apical spines, yellow .... *excisus*

24 (23). Terminal and second nodes subequal, separated by a constriction only, apical spines exceptionally long, spine beneath extended almost to tips tegmina; pronotum black, lateral margins, arcuate front line, yellow .... *belliger*

25 (22). Tegmina longer than posterior pronotal process.

26 (31). Nodes of posterior process differing in size.

27 (30). Terminal node larger than second node.

28 (29). Second node nearly size of third node, apical nodes subequal; pronotum yellow with irregular black or fuscous markings .... *spinosus*

29 (28). Second node much smaller than third node, terminal spine much longer than lateral spines; pronotum piceous or black, arcuate front line, spot each side first node, and tips apical spines, yellow .... *aethiops*

30 (27). Terminal node much smaller than second node, not constricted between first and second nodes, a short distinct petiole between second and third nodes, apical spines subequal; pronotum yellow, two broad stripes connected by a transverse band at base posterior process, dorsal spines, and marks on second and third nodes, black .... *vespiformes*

31 (26). Second and third nodes of posterior process subequal, constricted between first and second nodes.

32 (33). Third and second nodes separated by a distinct short petiole; pronotum ferruginous, arcuate front line, spot on bases tegmina, spot each side third node, yellow, tip terminal spine white .... *nodosus*

33 (32). Third and second nodes separated by a constriction only; pronotum fuscous or ferruginous, middle of basal margin, lateral margins to first node, spot between first and second nodes, and band on terminal spine yellow. .*horridus*

34 (21). Terminal spine elongate, claviform, constricted behind base.

35 (36). Tegmina and posterior process subequal, terminal spine strong and long, terminal node strongly reticulated; pronotum fuscous, median line to first node, sometimes lateral margins then joined to median line, band each side first and terminal nodes, lateral and tip terminal spines, yellow or white .... *reticulatus*

36 (35). Tegmina much shorter than posterior process, lateral apical spines weak, terminal spine slender, terminal node not reticulated; pronotum brown, median and two lateral lines each side inner pairs abbreviated, marginal lines on first band on terminal nodes, yellow .... *flavolineatus*

37 (20). Posterior pronotal process with three distinct nodes.

38 (45). Tegmina equal or longer than posterior process.

39 (40). Tegmina longer than posterior process, terminal node globose; pronotum testaceous, arcuate front spot and disk fuscous brown, dorsal spines and sides first node black. *clavatus*

40 (39). Tegmina and apex posterior pronotal process subequal.

41 (44). Nodes of posterior process not equal, varying in size.

42 (43). First node smallest, second and third nodes subequal separated by a short petiole, apical spines long, slender; pronotum yellow, stripe each side from base connected with a line from each eye to humerals, spot each side of dorsum, and sides second and third nodes, black, tips lateral apical spines white .... *albospinosus*

43 (42). Second node smallest, third node largest, terminal spine strong; pronotum brown to black, subpubescent, median carina in front, sometimes lateral margins, and lines on nodes, yellow .... *trinodosus*

44 (41). Nodes of posterior process subequal, very small; pronotum yellow to testaceous, two stripes on dorsum, sometimes lateral margins, dorsal spines, and marks on nodes, black, tips lateral apical spines white ....*xanthomelas*

45 (38). Tegmina shorter than posterior process, first and third nodes large, second node smaller, nodes ovate, lateral apical spines small, terminal spine strong; pronotum reddish yellow, punctured and reticulate, five lines on dorsum, band on first and second nodes, white ....*bicornis*

46 (19). Pronotum quadrinodose posteriorly, punctured, piceous to black, lateral apical spines short, terminal spine below third node long and strong; lateral margins and line on first node yellow or white; tegmina shorter than posterior process.

47 (48). First and second nodes of posterior process subequal, third node smaller, fourth node much larger and more strongly punctured; pronotum shining piceous.
quadrinodosus

48 (47). First and fourth nodes subequal, second and third nodes smaller, third node smallest; pronotum black.
quinquenodosus

List of Species

delineatus Walker, List Hom. Brit. Mus. Suppl., p. 154, (1858). Butler, Cist. Ent., II, p. 358, pl. 7, fig. 9, (1878). [Ega, Brazil; Tena, Ecuador].

inermis Schmidt, Ent. Mitt., XII, p. 294, ♂, (1924). [Magdalena River, Colombia].

spinosa Schmidt, Ent. Mitt., XII, p. 294, ♀, (1924). [Magdalena River, Colombia].

glanduliger Lesson, Ills. Zool., pl. 57, fig. 2, ♀, (1831). Buckton, Mon. Memb., p. 142, pl 30, fig. 5, (1903). [Rio Janeiro, Brazil].

nigricans Laporte, An. Soc. Ent. Fr., I, p. 96, pl. 3, fig. 8, ♂, (1832). Westwood, Int. Clas. Ins., p. 432, fig. 116, (1840). Buckton, Mon. Memb., p. 142, pl. 30, fig. 4, (1903). [Rio Janeiro, Brazil].

fowleri Buckton, Mon. Memb., p. 141, pl. 30, fig. 2a, ♂, (1903). [Rio Janeiro, Brazil].

abcisus Walker, List Hom. Brit. Mus., p. 595, (1851). [Para, Brazil].

bulliferus Burmeister, Rev. Ent. Silb., I, p. 229, (1833). [Bahia, Brazil].

bulbifera Walker, List Hom. Brit. Mus., p. 595, (1851). [Brazil].

leucotelus Walker, List Hom. Brit. Mus. Suppl., p. 155, (1858). [Ega, Brazil].

stipatus Walker, List Hom. Brit. Mus. Suppl., p. 155, (1858). [Constancia, Brazil].

armatus Laporte, An. Soc. Ent. Fr., I, p. 97, ♀, (1832). Haviland, Zool. VI, p. 245, pl. 3, fig. 8, (1925). [Cayenne, Dutch Guiana; Kartabo, British Guiana].

fuscus Laporte, An. Soc. Ent. Fr., v, p. 98, ♀, (1832). [Cayenne, Dutch Guiana].

tridens Burmeister, Rev. Ent. Silb., I, p. 229, ♂, (1833). [Rio Janeiro, Brazil].

divisus Walker, List Hom. Brit. Mus. Suppl., p. 156, (1858). [Para, Brazil].

abbreviatus Fairmaire, Rev. Memb., p. 500, pl. 7, fig. 26, (1846). [Brazil].

excisus Walker, List Hom. Brit. Mus., p. 593, pl. 4, figs. 10-11, (1851). [Bahia, Brazil].

belliger Butler, Cist. Ent., II, p. 359, pl. 7, fig. 13, (1878). [St. Paul, Brazil].

spinosus Laporte, An. Soc. Ent. Fr., I, p. 96, pl. 3, fig. 7, (1832). [Cayenne, Dutch Guiana; Tunantins, Brazil].

confusus Butler, Cit. Ent., II, p. 360, pl. 7, fig. 10, (1878). [Tunantins, Brazil].

nodosus Walker, List. Hom. Brit. Mus. Suppl., p. 154, (1858). Butler, Cist. Ent., II, p. 360, (1878). [Santarem, Tapajos, Brazil].

strigosus Butler, Cist. Ent., II, p. 361, pl. 7, fig. 11, (1878). Buckton, Mon. Memb., p. 143, pl. 30, fig. 6, (1903). [St. Paulo, Upper Amazon, Brazil].

aethiops Butler, Cist. Ent., II, p. 359, pl. 7, fig. 7, (1878). [Ecuador].

vespiformis Haviland, Zool., VI, p. 247, pl. 3, fig. 7, (1925). [Kartabo, British Guiana; Cuenca, Ecuador].

nodosus Germar, Mag. Ent., IV, p. 30, pl. 1, fig. 2, (1821). [Constancia, Santarem, Tapayos, Brazil].

horridus Fabricius, Mant. Ins., II, p. 264, (1787). [Cayenne, Dutch Guiana; Para, Brazil; Napo River, Ecuador].

reticulatus Burmeister, Rev. Etn. Silb., I, p. 227, (1833). [Brazil].

vulnerans Germar, Rev. Ent. Silb., I, p. 228, (1833). Fairmaire, Rev. Memb., p. 500, pl. 7, fig. 25, (1846). Buckton, Mon. Memb., p. 141, pl. 30, fig. 1, (1903). [Rio Janeiro, Brazil; Panama; Central America; Mexico].

signatus Burmeister, Rev. Ent. Silb., I, p. 228, (1833). [Brazil].

flavolineatus Laporte, An. Ent. Soc. Fr., I, p. 96, pl. 3, fig. 9, ♂, (1832). Amyot and Serville, Hem., p. 549, pl. 9, fig. 6, (1843). [Rio Janeiro, Brazil].

inermis Laporte, An. Ent. Soc. Fr., I, p. 97, pl. 3, fig. 10, ♀, (1832). Buckton, Mon. Memb., p. 142, pl. 30, fig 3, (1903). [Rio Janeiro,

furcatus Gray, An. King. Ins., p. 161, pl. 108, fig. 3, (1832). Jardine, Nat. Libr., I, p. 236, pl. 25, (1846). [Brazil].

fowleri Buckton, Mon. Memb., p. 141, pl. 30, fig. 2, (1903). [Brazil].

albospinosus Haviland, Zool., VI, p. 245, pl. 3, fig. 6, (1925). [Kartabo, British Guiana].

clavatus Perty, Del. An. Art., p. 177, pl. 35, fig. 7, (1834). [Bahia, Brazil].

trinodosus Butler, Cist. Ent., II, p. 357, pl. 7,, fig. 8, (1878). Lethierry, An. Soc. Fr., p. 154, (1890). Fowler, Biol. Cen.-Am. Hom., II, p. 82, pl. 6, figs. 17-17, (1895). [Mexico; Central America; Chiriqui, Panama].

quadrinodosus Walker, List Hom. Brit. Mus., p. 592, (1851). [Mexico].

lethierryi Goding, Cat. Memb. No. Am., p. 453, (1894). [Corozal, Venezuela].

xanthomelas Walker, List Hom. Brit. Mus. Suppl., p. 339, (1858). [Tunantins, Brazil].

leucotelus Walker, List Hom. Brit. Mus. Suppl., p. 339, (1858). [Ega, St. Paulo, Brazil].

parvinodes Butler, Cist. Ent., II, p. 361, pl. 7, fig. 12, (1878). [Ega, Brazil].

bicornis Lesson, Ills. Zool., pl. 57, fig. 1, (1832). [Constancia, Brazil].

bicinctus Kirby, Elem. Ent., p. 249, pl. 80, fig. 8, (1892). [Rio Janeiro, Brazil].

quadrinodosus Fairmaire, Rev. Memb., p. 499, pl. 7, fig. 27, (1846). [Mexico].

quinquenodosus Stal, Stet. Ent. Zeit., XXV, p. 70, (1846). [Mexico].

Subfamily SMILIINAE

Tribe CERESINI

Genus **CYPHONIA**

Laporte, Ann. Soc. Ent. Fr., I, p. 229, (1832).

Key to Species

1 (6). Pronotum smooth, shining, front sometimes obsoletely granular.

2 (3). Lateral apical spines slender from bases, suprahumerals slender from bases, both acute; pronotum black, median line and legs yellow, abdomen red or yellow tip black; hirsute .... *trifida*

3 (2). Lateral apical spines thick at bases or slender and bulbous at middle, suprahumerals slender; strongly hirsute.

4 (5). Bases lateral apical spines rather slender, middle swollen in bulb usually reddish; pronotum black or brown. *clavata*

5 (4). Bases lateral apical spines thick, cylindrical, slender from middle to tips, not bulbous; pronotum pale ferruginous to black, abdomen and legs paler .... *hirta*

6 (1). Pronotum coarsely granular or warty.

7 (10). Suprahumerals gradually acuminate.

8 (9). Small; lateral apical spines slender, bulbous swelling at middle; pronotum ferruginous to black; covered with long white hairs; abdomen and legs yellow; long 5 mm. *clavigera*

9 (8). Larger; lateral apical spines thick from bases to middle, then attenuated to tips; pronotum black, shining, not hirsute, median line including head, lateral margins, warts, band on spines, margins abdominal segments, and legs mostly, yellow; long 8 mm. .... *braccata*

10 (7). Suprahumerals thick at bases, tips slender, acute.

11 (14). Bases and tips lateral apical spines slender, swollen at middle, trifurcate process globular.

12 (13). Pronotum robust, black, abdomen and legs yellow. *furcata*

13 (12). Smaller, more slender, entirely yellow .... *flava*

14 (11). Bases lateral apical spines thick to middle, abruptly slender to tips; pronotum ferruginous, abdomen black and ferruginous, legs testaceous .... *capra*

trifida Fabricius, Ent. Syst., IV, p. 12, (1775). Amyot and Serville, Hemip., p. 540, pl. 9, fig. 8, (1843). Buckton, Mon. Memb., p. 164, pl. 33, figs. 3-4, (1903). [Rio Janeiro, Amazons, Chapada, Brazil; Trinidad; Peru; Tena, Mera, Baños, Ecuador].

ornata Laporte, Ann. Soc. Ent. Fr., I, p. 230, pl. 6, fig. 4, (1832). [Brazil].

proxima Guerin, Ic. Reg. An., III, p. 365, pl. 59, fig. 3, (1838). [Mexico; Ega, Para, Brazil].

flavovittata Stal, Bid. Memb. Kan., p. 242, (1869). [Bogota, Colombia].

jugalis Buckton, Mon. Memb., p. 165, pl. 34, fig. 1, (1903). [Amazons, Brazil].

clavata Fabricius, Mant. Ins., II, p. 264, (1787); in Coquebert, Ills. Icon. Ins., pl. 18, fig. 5, (1799). Buckton, Mon. Memb., p. 164, pl. 33, fig. 5, (1903). Cambridge Nat. Hist. Ins., II, fig. 283, (1909). [Rio Janeiro, Rio Negro, Tejuca, Amazons, Corumba, Assu, Carvoeira, Brazil; Tukeit, Kartabo, Bartica, Tumatumari, New Amsterdam, British Guiana; Paramaribo, Dutch Guiana; Tena, Mera, Cuenca, Baños, Ecuador; Callanga, Peru; Bugaba, Chiriqui, David, Panama, Mexico; Central America].

bulbifera Stoll, Cig., p. 82, pl. 21, fig. 115, (1788). [Surinam, Cayenne, Dutch Guiana].

hispida Walker, List Hom. Brit. Mus. Suppl., p. 156, (1858). [Tejuca, Rio Janeiro, Brazil].

fuscata Buckton, Mon. Memb., p. 165, pl. 33, fig. 7, (1903). [Amazons, Para, Brazil].

hirta Germar, Rev. Ent. Silb., III, p. 255, (1835). Fairmaire, Rev. Memb., p. 502, pl. 7, fig. 23, (1846). [Rio Janeiro, Brazil].

nasalis Stal, Hem. Rio Jan., II, p. 34, (1862). [Rio Janeiro, Brazil; Kartabo, British Guiana].

furcispina Lethierry, An. Soc. Ent. Fr., p. 155, (1890). [San Steban, Venezuela].

clavigera Fabricius, Syst. Rhyng., p. 17, (1803). Buckton, Mon. Memb., p. 164, pl. 33, fig. 6, (1903). [Bahia, Para; Rio Janeiro, Amazons, Brazil; Uruguay; Patagonia].

braccata Germar, Rev. Ent. Silb., III, p. 254, (1835). Fairmaire, Rev. Memb., p. 503, pl. 7, fig. 24, (1846). [Rio Janeiro, Chapada, Brazil].

ancoralis Berg, Hem. Argent. Ad. y Emend., p. 147, (1884). [Tucuman, Argentina].

furcata Burmeister, Rev. Ent. Silb., I, p. 231, (1833). [Santarem, Chapada, Para, Brazil].

fasciata Butler, Cist. Ent., II, p. 214, (1877). [Brazil].

colenophora Berg, Hem. Argent., p. 239, (1879). [Baradero, Buenos Aires, Argentina].

flava Burmeister, Rev. Ent. Silb., I, p. 231, (1833). [Rio Janeiro, Chapada, Brazil; Entre Rios, Corrientes, Misiones, Buenos Aires, Argentina].

capra Burmeister, Rev. Ent. Silb., I, p. 231, (1833). Fairmaire, Rev. Memb., p. 502, pl. 7, fig. 22, (1846). [Brazil].

bonaerensis Berg, Hem. Argent., p. 240, (1879). [Buenos Aires, Richeulo de Barracas, Argentina].

furcifera Berg, (in litt); Funkhouser, Cat. Memb., p. 210, (1927). [Brazil].

Genus **POPPEA**

Stal, Bid. Hem. Syst., p. 551, (1867).

Key to Species

1 (6). Dorsum of pronotum seen from side moderately sinuate, not excavated.

2 (3). Lateral apical spines swollen from bases, abruptly slender from middle to tips; pronotum black, shining, dorsum distinctly convex behind suprahumerals ....*subrugosa*

3 (2). Lateral apical spines gradually acuminate from bases; pronotum variously colored, not black.

4 (5). Large; dorsum nearly straight, slightly sinuate; pronotum immaculate yellow or ferruginous ....*rectispina*

5 (4). Smaller; dorsum distinctly but slightly convex behind suprahumerals; pronotum yellow or testaceous with black markings ....*formosa*

6 (1). Dorsum of pronotum seen from side abruptly and deeply sulcate or excavate before trifurcate process; pronotum yellow to brown.

7 (12). Lateral apical spines swollen from bases, abruptly slender from middle to tips.

8 (11). Suprahumerals swollen from bases, abruptly slender from middle to tips.

9 (10). Dorsal humps equal, first hump situate just behind suprahumerals its front excavated enclosing a slight convexity; yellow .... *setosa*

10 (9). Dorsal humps unequal, head uneven, longer than broad between eyes, concolorous with long pale hairs, lateral margins and small spot at base of long narrow clypeus yellow; ocelli equidistant. Pronotum dark reddish brown, covered with long pale hairs, small node on base behind each eye, bases suprahumerals strongly swollen abruptly slender from middle and yellow; first dorsal hump small situate just behind suprahumerals, second hump four times larger, vertically impressed each side and behind, both hemispherical, and small node each side beneath first hump touching lateral margin, second hump (trifurcate process) with three spines, middle one long, slender, four times longer than lateral spines its apical half white extreme tip black, lateral spines very short, bases swollen then abruptly slender to tips with broad white band, the spines covered with long white hairs. Tegmina vitreous, basal half of veins and large apical spot piceous. Chest brown, abdomen brown apical half largely sanguineous, legs yellow, femora brown, hind tibae clouded with brown. Long. cum teg. 8 mm.; lat. inter hum. 2.5 mm. Type, female, in collection F. W. Goding. Habitat: Callanga, Peru .... **discrepans** new species

11 (8). Suprahumerals gradually acuminate from bases, slightly behind them is convex first hump not excavate anteriorly; pronotum yellow to brown .... *torva*

12 (7). Lateral apical spines and suprahumerals gradually acuminate from bases; first dorsal hump hemispherical, distant from superhumerals; pronotum reddish to black, shining, lateral margins and median stripe often pale yellow .... *capricornis*

List of Species

subrugosa Fowler, Biol. Cen.-Am. Hom., II, p. 99, pl. 7, fig. 5, (1894). Buckton, Mon. Memb., p. 168, pl. 34, fig. 7, (1903). [Cerro Zunil, Guatemala; Colombia; Peru].

rectispina Fairmaire, Rev. Memb., p. 502, pl. 7, fig. 21, (1846). Buckton, Mon. Memb., p. 167, pl. 34, fig. 6, (1903). [Mexico; Central America; Peru].

formosa Butler, Cist. Ent., II, p. 214, pl. 3, fig. 6, (1877). [Mexico].
concinna Fowler, Biol. Cen-Am. Hom., II, p. 100, pl. 7, fig. 7, (1894). Buckton, Mon. Memb., p. 167, pl. 34, fig. 4, (1903). [Bugaba, Chiriqui, Panama].
affinis Fowler, Biol. Cen.-Am. Hom., II, p. 100, pl. 7, fig. 8, (1894). [Guatemala; Central America].
munda Fowler, Biol. Cen.-Am. Hom., II, p. 101, pl. 7, fig. 9, (1894). [Chiriqui, Calera, Panama].
reticulata Fowler, Biol. Cen.-Am. Hom., II, p. 101, (1894). [Guatemala, Central America].
setosa Fowler, Biol. Cen.-Am. Hom., II, p. 97, pl. 7, fig. 3, (1894). Buckton, Mon. Memb., p. 166, pl. 34, fig. 2, (1903). [Mexico].
discrepans new species. [Calanga, Peru].
torva Fowler, Biol. Cen.-Am. Hom., II, p. 98, pl. 7, fig. 4, (1894). [Guatemala].
succinea Buckton, Trans. Ent. Soc. Lond., IX, p. 331, pl. 21, fig. 7, (1905). [Mexico].
capricornis Fowler, Biol. Cen.-Am. Hom., II, p. 99, pl. 7, fig. 6, (1894). Buckton, Mon. Memb., p. 166, pl. 34, fig. 3, (1903). [Bugaba, Chiriqui, Panama; Peru].

Genus **ANTONAE**

Stal, Bid. Hem. Syst., p. 552, (1867). *Tumayua* Schmidt, Stet. Ent. Zeit., LXVII, p. 368, (1906).

Key to Species

1 (8). Pronotum uni- or binodose or sinuate on dorsum, spined above each humeral; basal third or half tegmina often black, opaque.

2 (3). Posterior pronotal process convex anteriorly, not compressed or tectiform, a large tumescence at middle which is broadened behind at least long as broad, broader than high, obsoletely carinate, suprahumerals horizontal, straight; pronotum black with few yellow markings ....*inflata*

3 (2). Posterior pronotal process elevated and tectiform anteriorly, distinctly carinate, broadest at middle or anteriorly, narrowed posteriorly, longer than broad; pronotum black and yellow, superhumerals straight.

4 (5). Dorsal swelling without lateral impression, dorsum binodose or bisinuate, narrowed between, posterior node large ....*incrassata*

5 (4). Dorsal node with semicircular lateral impressions.

6 (7). Dorsal node large, pronotum bisinuate, suprahumerals straight, usually yellow, black spot on dorsal swelling. *flaccida*

7 (6). Dorsal node small slightly elevated, suprahumerals black recurved to tips; pronotum testaceous with black markings or black sprinkled with small yellow spots; head and metopidium often pale yellow .... *tigrina*

8 (1). Pronotum yellow to ferruginous with six nodes, one each side above humerals bearing a slender horizontal spine, one at base posterior process, a smaller one each side below touching lateral margin, and a large node behind bearing a long slender spine; black spot under each eye, and on bases and tips tibiae.

9(10). Ocelli nearer to each other than to eyes; veins tegmina concolorous .... *nodosa*

10 (9). Ocelli equidistant; black marks on some veins tegmina. *guttipes*

List of Species

inflata Stal, Bid. Memb. Kan., p. 243, (1869). [Bogota, Colombia].

incrassata Fairmaire, Rev. Memb., p. 288, (1846). [Bogota, Colombia].

aurantiaca Fairmaire, Rev. Memb., p. 288, pl. 3, figs. 23-24, (1846). [Bogota, Colombia].

picina Stal, Bid. Memb. Kan., p. 243, (1869). [Bogota, Colombia].

conspersa Stal, Bid. Memb. Kan., p. 244, (1869). [Bogota, Colombia].

flaccida Fairmaire, Rev. Memb., p. 288, (1846). [Bogota, Colombia; Tovar, Venezuela].

tigrina Fairmaire, Rev. Memb., p. 287, (1846). [Bogota, Colombia, Bolivar].

nodosa Funkhouser, Can. Ent., XLIV, p. 403, pl. 24, fig. 8, (1914). [Mapiri, Bolivia; Tena, Napo River, Ecuador].

guttipes Walker, List Hom. Brit. Mus. Suppl., p. 157, (1858). [Tena, Napo River, Ecuador].

eva Schmidt, Stet. Ent. Zeit., LXVII, p. 368, (1906). [Chanchamayo, Peru].

Genus **PARANTONAE**

Fowler, Biol. Cen.-Am. Hom., II, p. 101.

Key to Species

1 (2). Pronotum longer than broad, angulate laterally at middle, shining black; posterior dilatation globose, very large, posterior spine short, very slender; basal half tegmina brown, apical half yellow hyaline .... *dipteroides*

2 (1). Pronotum round, dome-shaped, dull black, base posterior process elevated in a transverse triangular compressed process behind it a hemispherical dilatation gradually narrowed posteriorly to apex, apex acute its dorsum almost foliaceous, tegmina black, opaque, with three transverse colorless bands .... *binodosa*

List of Species

dipteroides Fowler, Biol. Cen.-Am. Hom., II, p. 102, pl. 7, fig. 10, (1895). [Central America].

binodosa Goding, Trans. Am. Ent. Soc., LII, p. 108, (1926). [Tena, Napo River, Ecuador].

Note—Hispida Van Duzee had been described from California.

Genus ILITHUCA

Stal, Bidrag Hemip. Syst., p. 552. *Electrophina* Buckton, Trans. Lin. Soc. Lond., IX, p. 331.

Key to Species

1 (4). Suprahumerals horizontal, tips tegmina broadly brown.

2 (3). Pronotum black or brown, shining, semicircular impression each side, dorsum lightly sinuate beyond middle, suprahumerals horizontal, recurved; body black, tibiae yellow; tegmina yellow hyaline, tips brown .... *morio*

3 (2). Pronotum yellow anteriorly, brown posteriorly a black spot at middle; suprahumerals horizontal, recurved, dorsum lightly bisinuate; head, body and legs, yellow; tegmina vitreous, tips broadly brown .... *terminata*

4 (1). Suprahumerals extended outward and upward, tips tegmina concolorous, pronotum slightly inflated, dorsum sinous; yellow, patch on metopidium, median transverse stain behind humerals, and posterior apex, fuscous; tegmina yellow hyaline, veins fuscous .... *pacificata*

List of Species

morio Fairmaire, Rev. Memb., p. 287, (1846). [Bogota, Colombia].

terminata Fairmaire, Rev. Memb., p. 287, (1846). [Colombia].

pacificata Buckton, Trans. Ent. Soc. Lond., IX, p. 331, pl. 21, fig. 8, (1905). [Pacific Coast].

Genus MELUSINA

Stal, Bidrag Hemip. Syst., p. 552.

Key to Species

1 (4). Head smooth, pronotum yellow with black markings.

2 (3). Pronotum yellow, black punctured, not pubescent, median carina distinctly precurrent, slightly tumescent behind semicircular impressions, apex and spot on lateral margins behind tumescence blackish; body, legs, tegmina with veins, concolorous .... *exaltata*

3 (2). Pronotum pale yellow, pubescent, black spot behind lateral impressions, apex concolorous; tegmina vitreous, veins brown .... *nervosa*

4 (1). Head strongly rugose; pronotum green or olivaceous, front and lateral margins at bases piceous, posterior process infuscate towards apex, with a median carina; body fuscous; tegmina pale yellow hyaline .... *rugifrons*

List of Species

exaltata Fabricius, Syst. Rhyng., p. 10, (1803). [Misiones, Argentina].
chlorotica Fairmaire, Rev. Memb., p. 289, (1846). [Brazil].
nervosa Fairmaire, Rev. Memb., p. 289, (1846). [Brazil].
rugifrons Berg, Hemip. Argent. Ad. y Emend., 150, (1884). [Buenos Aires, Argentina].

Genus **CENTROGONIA**

Stal, Hem. Fabr., II, p. 24, (1869).

Key to Species

1 (10). Suprahumerals short, almost horizontal.

2 (5). Pronotum with stripes; tips suprahumerals lightly recurved.

3 (4). Pronotum black, dull, lateral margins nearly to apex and rarely an irregular dorsal area yellow; tips suprahumerals lightly decurved .... *flavolimbata*

4 (3). Pronotum yellow, shining, vitta each side converging behind between suprahumerals, and obsolete spot posteriorly ferruginous .... *unguicularis*

5 (2). Pronotum without stripes, sometimes with subapical fuscous band.

6 (7). Long. 9 mm.; pronotum pale gray or green; body and tips tarsi black .... *ciliata*

7 (6). Long. 7 mm.

8 (9). Apex posterior pronotal process pale fuscous, far passing abdomen; pronotum robust, yellow-testaceaus; veins tegmina pale .... *nasuta*

9 (8). Apex posterior pronotal process fuscous annulate, slightly longer than abdomen; pronotum slender, testaceous-brown irrorate, tips suprahumerals black, recurved; veins tegmina piceous .... *elegans*

10 (1). Suprahumerals curved more or less upward.

11 (12). Long. 10 mm.; pronotum yellow, lightly pubescent, rugose; suprahumerals robust, brown above, tips turned lightly upward and recurved; posterior process mottled with brown, far passing abdomen; veins tegmina yellow.... *lutea*

12 (11). Long. 7 mm.; slightly pilose; posterior pronotal process slightly longer than abdomen.

13 (14). Suprahumerals robust, depressed and flat between, brown above, strongly curved upward and outward, tips recurved, obtuse; posterior process concolorous; tegmina hyaline; chest and legs brown and yellow, abdomen yellow; ocelli equidistant .... *pinguicornis*

14 (13). Suprahumerals strong, brown above, lightly convex between; pronotum testaceous often with broad transverse piceous subapical band and annulate behind; veins lurid, veins piceous; body concolorous, abdomen darker. *centrotoides*

List of Species

flavolimbata Goding, Bol. Med. Cir. Guay., XVIII, p. 35, fig. 6, (1920); Ent. News, XXXI, p. 156, (1920). [Pifo, Azogues, Ecuador].

unguicularis Stal, Hem. Rio Jan., II, p. 26, (1862). [Rio Janeiro, Brazil].

ciliata Fairmaire, Rev. Memb., p. 287, (1846). [Bogota, Colombia].

nasuta Stal, Eug. Resa, Om. Jord. Ent. Bid., p. 283, (1859). [Island Tahaite].

elegans Fowler, Biol. Cen.-Am. Hom., II, p. 107, pl. 7, fig. 16, (1894). [Chiriqui, Panama; Huigra, Bucay Chico, Ambato, Cuenca, Biblian, Navangon, Chanaguera, Baños, Tena, Pichincha, Ecuador; Corumba, Brazil].

lutea Funkhouser, Jour. N. Y. Ent. Soc., XXVII, p. 269, (1919). [Bogota, Colombia; Cuenca, Ecuador].

pinguicornis Funkhouser, Jour. N. Y. Ent. Soc., XXVII, p. 270, (1919). [Chosica, Peru].

centrotoides Walker, List Hom. Brit. Mus. Suppl., p. 138, (1858). [Napo River, Ecuador; Chapada, Brazil].

Genus **CERESA**

Amyot y Serville, Hemip., p. 539, (1843). *Ceresinae* Johnson and Ledig, Jour. Ent. and Zool., p. 7, (1918).

Key to Species

1 (32). Suprahumerals directed outward, not forward, sometimes recurved.

2 (21). Suprahumerals, fascia on apical part posterior pronotal process fuscous or black; pronotum testaceous, yellow, bronze brown, reddish, piceous, or black.

3 (6). Tips tegmina infuscate or brown spotted, dorsum nearly level.

4 (5). Long. 7 mm.; suprahumerals brown, flat, margins parallel nearly to tips the front margins abruptly recurved,

vitta from tip each side to humeral, apical half posterior process, chest, apex abdomen and legs mostly, piceous or ferruginous brown ....*ustulata*

5 (4). Long. 11-12 mm.; suprahumerals gradually acuminate from bases, not broad and flat, brown, tips black; subulate part posterior process, body and veins tegmina reddish; dorsum elevated ....*robusta*

6 (3). Tegmina hyaline, bases briefly darker.

7 (8). Pronotum bronze-brown to black, seen from front convex; suprahumerals directed slightly downward, tips recurved, black; dorsum well arched, subulate part of apex black, slightly longer than abdomen; ocelli nearer each other than eyes ....*cuprea*

8 (7). Pronotum yellow, rarely dark testaceous.

9 (12). Posterior pronotal process with piceous fascia each side front of apex, pronotum and legs yellow; dorsum slightly elevated.

10 (11). Long. 6 mm.; pronotum pale yellow ....*bifasciata*

11 (10). Long. 9-10 mm.; pronotum reddish testaceous or pale brown, black on suprahumerals sometimes obsolete. *nigrovittata*

12 (9). Posterior pronotal process without piceous fasciae.

13 (14). Median carina black which extends from tips suprahumerals each side to humeral, above to highest point, and behind to apex; pronotum testaceous sprinkled with small pale spots ....*sallei*

14 (13). Median carina concolorous, apex, and suprahumerals brown

15 (16). Lateral margins pronotum with a white line each side usually extended to suprahumerals ....*bonasia*

16 (15). Lateral margins pronotum concolorous, suprahumerals and posterior apex, fuscous.

17 (18). Suprahumerals long, strong, tips recurved; pronotum reddish or testaceous, apex long as abdomen; body fuscous; larger ....*brunnicornis*

18 (17). Suprahumerals short, acute, straight; smaller.

19 (20). Suprahumerals very short; body black, dorsum abdomen and pronotum yellow; long. 6 mm. ....*discolor*

20 (19). Suprahumerals median short; pronotum green or testaceous, body testaceous or yellow below; long. 7-8 mm. *malina*

21 (2). Suprahumerals and apex posterior pronotal process concolorous, not fuscous or black; pronotum yellow or testaceous; tegmina unspotted.

22 (25). Dorsum pronotum flat, almost straight, not highly elevated.

23 (24). Posterior pronotal process much longer than abdomen. *extensa*

24 (23). Posterior pronotal process long as abdomen.....*excisa*

25 (22). Dorsum pronotum more or less strongly elevated at middle.

26 (27). Median carina pronotum black or brown, pronotum testaceous, usually sprinkled with paler, two pale lines each side; suprahumerals short, conical, tips lightly recurved; long. 11 mm. ....*testacea*

27 (26). Median carina pronotum concolorous or slightly darker, rarely bright red, never black.

28 (31). Long. 6-8 mm.

29 (30). Pronotum testaceous or reddish, a white line or row of dots covering lateral semicircular impressions, median carina and suprahumerals rarely bright red ....*vitulus*

30 (29). Pronotum entirely yellow or testaceous, lateral impressions concolorous ....*jugifera*

31 (28). Long. 11 mm.; pronotum testaceous red sprinkled with white dots, median carina darker; dorsum depressed anteriorly, strongly elevated at middle; suprahumerals very short, conical, flat between ....*affinis*

32 (1). Suprahumerals projecting forward and outward, sometimes lightly upward.

33 (34). Tips tegmina, suprahumerals, and apex posterior pronotal process fuscous or black; long. 8 mm. ......*cavicornis*

34 (33). Tegmina entirely hyaline, unspotted.

35 (36). Long. 11-12 mm.; posterior pronotal process much shorter than tegmina, dorsum highly arched at middle. *vacca*

36 (35). Long. 7 mm.; posterior pronotal process nearly long as tegmina, dorsum flat, not highly elevated ....*projecta*

List of Species

ustulata Fairmaire, Rev. Memb., p. 285, (1846). [Rio Janeiro, Brazil; Corrientes, Misiones, Argentina].

plana Walker, List Hom. Brit. Mus., p. 529, (1851). [Brazil].

uruguayensis Berg, Hem. Argent. Add. y Emend., p. 148, (1884). [Rio Corralito, Uruguay].

robusta Butler, Cist. Ent., II, p. 216, pl. 3, fig. 10, (1877). [Brazil].

cuprea Funkhouser, Jour. N. Y. Ent. Soc., xxxv, p. 160, pl. 17, fig. 3, (1927). [Bauru, Saõ Paulo, Brazil].

nigra Goding Bul. Brook. Ent. Soc., XXIII, p. 137, (1928). [Guabito, Bocas del Toro, Panama].

bifasciata Fairmaire, Rev. Memb., p. 286, (1846). [Chapada, Brazil; Baradero, Corruntes, Argentina].

nigrovittata Fowler, Biol. Cen.-Am. Hom., II, p. 104, pl. 7, fig. 12, (1894). Buckton, Mon. Memb., p. 172, pl. 36, fig. 1, (1903). [Central America].

subfusca Buckton, Mon. Memb., p. 122, pl. 25, fig. 6, (1903). [Chiriqui, Panama].

nitens Buckton, Trans. Ent. Soc. Lond., IX, p. 332, pl. 21, fig. 9, (1905). [Chiriqui, Panama].

sallei Stal, Stet. Ent. Zeit., xxv, p. 70, (1864). [?ex].

nigricornis Fowler, Biol., Cen.-Am. Hom., II, p. 104, pl. 7, fig.11, (1894). [Mexico].

bonasia Fabricius, Ent. Syst., p. 677, (1775). [America].

aculeata Fairmaire, Rev. Memb., p. 283, (1846). [Bolivia].

brunnicornis Germar, Rev. Ent. Silb., III, p. 235, (1835). [Buenos Aires, Misiones, Catamarca, Argentina; Patagonia].

axillaris Germar, Rev. Ent. Silb., III, p. 235. Buckton, Mon. Memb., p. 169, pl. 35, fig. 1, (1903). [Amazons, Brazil; Tena, Ecuador].

terminalis Walker, List Hom. Brit. Mus., p. 528, (1851). [Brazil].

unicornis Fowler, Biol. Cen.-Am. Hom., II, p. 104, pl. 7, fig. 13, (1894). [Chiriqui, Panama].

variabilis Fowler, Biol. Cen.-Am. Hom., II, p. 105, (1894). Buckton, Mon. Memb., p. 170, pl. 35, fig. 5, (1903). [Bugaba, Chiriqui, Panama].

discolor Fairmaire, Rev. Memb., p. 286, (1846). [Brazil].

malina Germar, Rev. Ent. Silb., III, p. 236, (1835). [Buenos Aires, Argentina; Brazil].

alta Walker, List Hom. Brit. Mus., p. 529, (1851). Buckton, Mon. Memb., p. 172, pl. 36, fig. 2, (1903). [Unknown].

integra Walker, Ins. Saund. Hom., p. 67, (1858). [? South America].

extensa Walker, Ins. Saund. Hom., p. 68, (1858). [Colombia].

excisa Walker, Ins. Saund. Hom., p. 68, (1858). [? South America].

recta Walker, Ins. Saund. Hom., p. 68, (1858). [? South America].

testacea Fairmaire, Rev. Memb., p. 284, (1846). [Chiriqui, Caldera, David, Panama; Montevideo, Uruguay; Central America].

vitulus Fabricius, Syst. Ent., p. 667, (1775). Buckton, Mon. Memb., p. 172, pl. 35, fig. 8, (1903). [Rio Janeiro, Tumatumari, Assu, Corumba, Brazil; Mapiti, Bolivia; Tena, Mera, Ecuador].

jugifera Stoll, Cig., p. 36, pl. 6, fig. 32, (1788). [Surinam, Dutch Guiana].

colon Germar, Rev. Ent. Silb., III, p. 237, (1835). [Brazil].

puncticeps Stal, Stet. Ent. Zeit., xxv, p. 70, (1864). [Mexico].

pauperata Berg, Hem. Argent. Add. y Emend., p. 149, (1884). [Common in Uruguay; Assu, Chapada, Corumba, Brazil; common in Argentina; Bolivia; Matamoras, Mexico; Surinam, Dutch Guiana].

affinis Fairmaire, Rev. Memb., p. 284, pl. 5, figs. 21-22, (1846). [Brazil; Tena, Baños, Ecuador].

cavicornis Stal, Eug. Resa Om. Jord., p. 284, (1859). [Chacabuco, Montevideo, Uruguay; Carmen, Patagonia].

patruelis Stal, Stet. Ent. Zeit., xxv, p. 69, (1864). [Mexico].

stalli Butler, Cist. Ent., ii, p. 217, pl. 3, fig. 11, (1877). [Mexico].

vacca Fowler, Biol. Cen.-Am. Hom., ii, p. 106, pl. 7, fig. 14, (1894). [Mexico; Narangapata, Ecuador].

projecta Funkhouser, Jour. N. Y. Ent. Soc., xxxv, p. 161, pl. 17, fig. 4, (1927). [Cosquin, Sierra de Cordoba, Argentina].

Genus **STICTOCEPHALA**

Stal, Hemip. Fabricius, ii, p. 24. *Zucla* Fitch, MS.

Key to Species

1 (4). Lateral carinae of metopidium united on dorsum above humerals, not sharply carinate, dorsum almost straight, highest above humerals; pronotum reddish brown, or greenish-yellow mottled with brown, apex black.

2 (3). Metopidium vertical, high, slightly convex; pronotum reddish-brown, not pubescent; posterior process slightly longer than abdomen; body concolorous; length 8.5 mm. *elevata*

3 (2). Metopidium sloping, slightly convex; pronotum greenish yellow mottled with brown, apex slightly shorter than abdomen; chest yellow, abdomen black; length 5.5 mm. *nigriventris*

4 (1). Lateral carinae of metopidium united at middle of dorsum where it is highest, convex from base to apical third then subulate; pronotum testaceous-yellow, apex concolorous, slightly longer than abdomen; length 6 mm......*rotundata*

List of Species

elevata Funkhouser, Jour. N. Y. Ent. Soc., xxvii, p. 271, (1919). [Marcapata, Callanga, Peru].

nigriventris Funkhouser, Jour. N. Y. Ent. Soc., xxvii, p. 272, (1919). [Cali, Colombia; Ecuador].

rotundata Stal, Bid. Memb. Kan., p. 246, (1869). Metcalf and Bruner, Bul. Brook. Ent. Soc., xx, p. 206, pl. 1, figs. 13-14, (1925). [Santiago de las Vegas, Miranda, Nagua Oriente, Cuba; Port-au-Prince, Haiti; Florida; North Carolina].

uniformis Guerin, Hist. Cuba, Sagra, Ins., p. 434, pl. 13, fig. 20, (1856). [Cuba].

Genus **STICTOLOBUS**

Metcalf, Ent. News, xxvii, p. 3.

Key to Species

1 (4). Pronotum highest at middle of dorsum.

2 (3). Ocelli equidistant; pronotum reddish with seven pale yellow longitudinal lines; tegmina clear hyaline. *septemfasciatus*

3 (2). Ocelli nearer to each other than to eyes; pronotum yellow mottled with ferruginous, subapical spot, basal spot and transverse band on tegmina dark brown ....*maculatus*

4 (1). Pronotum highest above humerals, pale yellow without spots or stripes; ocelli nearer to each other than to eyes. *erectus*

List of Species

septemfasciatus Goding, Trans. Am. Ent. Soc., lii, p. 108, (1926). [Napo River, Ecuador].

maculatus Funkhouser, Jour. N. Y. Ent. Soc., xxxv, p. 162, pl. 17, fig. 5, (1927). [Paso Fundo, Rio Grande de Sul, Brazil].

erectus Funkhouser, Jour. N. Y. Ent. Soc., xxvii, p. 272, (1919). [Para, Brazil].

Tribe AMASTRINI

Genus **AMASTRIS**

Stal, Hem. Rio Jan., ii, p. 30, (1862).

Key to Species

1 (20). Dorsum pronotum entirely acute, seen from side gradually rounded from base; pronotum yellow or brown, sometimes with black markings.

2 (11). Pronotum strongly elevated, semicircular, about twice longer than high, highest front of middle.

3 (8). Median carina black or brown; posterior pronotal process long as tegmina.

4 (5). Basal margin pronotum projecting over base of head, metopidium higher than wide, dorsal crest inclined forward; long. 7 mm. ....*projecta*

5 (4). Basal margin pronotum even with base of head, not projecting.

6 (7). Pronotum reddish brown, shining, median carinae edged with black; long. 5 mm. ....*vismiae*

7 (6). Pronotum green and yellow mottled, narrow ferruginous area just below median carina, black on medium carina sometimes obsolete; long. 6 mm. ....*elevata*

8 (3). Median carina concolorous, not black or brown.

9 (10). Posterior pronotal process long as tegmina; metopidium rarely, chest, sides abdomen, legs, tegmina partly, fuscous; long. 5 to 6 mm. ....*flavifolia*

10 (9). Posterior pronotal process shorter than tegmina; body and legs concolorous (long. 3 to 4 mm.) ....*citrina*

11 (2). Pronotum less elevated, about three times longer than high, dorsum lightly rounded, highest near middle; venation sometimes irregular.

12 (13). Tarsi black, pronotum green or yellow, rough, surface granular; body and distal ends tibiae with dark brown markings; long. 3.5 mm. ....*sabulosa*

13 (12). Tarsi yellow.

14 (17). Dorsal carina and tips tegmina brown.

15 (16). Entirely yellow except carina and tips tegmina; long. 5.5 mm. ....*fallax*

16 (15). Green, metopidium and dots on median carina reddish brown; head below, femora, and mottlings on tibiae, brown; long. 4.5 mm. ....*maculata*

17 (14). Dorsal carina concolorous, not brown; posterior pronotal process shorter than tegmina.

18 (19). Basal third tegmina opaque dark brown, apical third hyaline tips clouded; pronotum green, very pubescent; metopidium broader than high; chest, abdomen and femora brown, tibiae green or yellow; long. 4 mm....*brunneipennis*

19 (18). Tegmina hyaline, bases briefly and tips brown; pronotum, body and legs yellow or green; long. 4.5 mm. *simillima*

20 (1). Dorsum pronotum convex anteriorly, abruptly elevated and acutely tectiform behind humerals, highest at middle, posterior process long as tegmina; pronotum pale green, hirsute, metopidium wider than high; body and legs yellow, tarsi black; long. 4 mm. ....*funkhouseri*

List of Species

projecta Funkhouser, Jour. N. Y. Ent. Soc., xxx, p. 28, (1922). [Peru].

vismiae Haviland, Zool. vi, p. 252, pl. 4, fig. 4, (1825). [Kartabo, British Guiana; Tena, Ecuador].

elevata Funkhouser, Jour. N. Y. Ent. Soc., xxx, p. 27, pl. 3, fig. 4, (1922). [Napo River, Iquitos, Peru; Teffe, Brazil; Kartabo, British Guiana].

citrina Fairmaire, Rev. Memb., p. 309, (1846). [Colombia; Venezuela; Huigra, Ecuador].

compacta Walker, List Hom. Brit. Mus. Suppl., p. 140, (1858). [Santarem, Rio Janeiro, Teffe, Brazil].

minuta Funkhouser, Jour. N. Y. Ent. Soc., xxx, p. 30, pl. 3, fig. 6, (1922). [Yurimaguas, Peru].

flavifolia Stoll, Cig., p. 61, pl. 15, fig. 78, (1788). [Surinam, Dutch Guiana; Machala, Ecuador; Assu, Chapada, Brazil].

obtegens Fabricius, Syst. Rhyng., p. 11, (1803). Fowler, Biol. Cen.-Am. Hom., II, p. 92, pl. 6, fig. 22, (1894). [Colombia; Venezuela; Chiriqui, Caldera, Panama; Mexico].

antica Germar, Mag. Ent., IV, p. 16, (1821). [Brazil].

sabulosa Funkhouser, Jour. N. Y. Ent. Soc., xxx, p. 29, pl. 3, fig. 5, (1922). [Flores, Manaos, Brazil; Yurimaguas, Peru].

fallax Stal, Hem. Rio Jan., II, p. 30, (1862). [Rio Janeiro, Teffe, Chapada, Brazil].

maculata Funkhouser, Jour. N. Y. Ent. Soc., xxx, p. 31, pl. 3, fig. 7, (1922). [Flores, Manaos, Brazil].

brunneipennis Funkhouser, Jour. N. Y. Ent. Soc., xxx, p. 31, pl. 3, fig. 8, (1922). [Obidos, Brazil; Iquitos, Peru; Narangapata, Huigra, Tena, Ecuador].

simillima Stal, Hem. Rio Jan., II, p. 30, (1862). [Rio Janeiro, Obidos, Chapada, Parintins, Brazil; Napo River, Iquitos, Peru].

consanguina Stal, Hem. Rio Jan., II, p. 30, (1862). [Rio Janeiro, Obidos, Parintins, Brazil].

funkhouseri Haviland, Zool., VI, p. 251, pl. 3, fig. 9, (1925). [Kartabo, British Guiana].

Genus BOETHOOS

Kirkaldy, Entomologist, XXXVII, p. 279. *Parmula* Fairmaire, Rev. Memb., p. 491.

Key to Species

1 (2). Head slightly shorter than wide between eyes, concave anteriorly, margins broadly reflexed; pronotum lightly depressed near middle of dorsum, variously colored; tegmina vitreous, apical part more or less fuscous or black marked .... *dispar*

a. Pronotum black or brown.

b. Dorsum with transverse yellow band near middle.

c. Dorsal yellow band entire
var. *b* Stal; *distinguenda* and var. *d* Fowler[3]

cc. Dorsal yellow band interrupted at middle.

d. Pronotum with yellow spot on each humeral.
var. *e* Fowler

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[3] Stal's varieties appear in Hem. Fabr., II, pp. 29-30, Fowler's in Biol. Cen.-Am. Hom., II, p. 90.

dd. Pronotum with lateral margins in front, and two lines on dorsum joined to transverse band, yellow. *bilinea*

bb. Pronotum black without transverse yellow band. *dispar*, and var. *g* Fowler

aa. Pronotum red or yellow with black markings.

e. Dorsum with transverse band and apex black.

f. Pronotum red, head and middle pronotum black. var. *b* Fowler

ff. Pronotum yellow, head and broad stripes from dorsal band to head black .... var. *f* Fowler

ee. Dorsum without transverse black band.

g. Pronotum orange-yellow, apex black.... var. *c* Fowler

gg. Pronotum red, head metopidium and apex. var. *a* Fowler

2 (1). Head much shorter than wide between eyes, apex obtusely rounded, hardly reflexed, subdepressed, margins hardly reflexed; pronotum slightly depressed at middle, variously colored; tegmina vitreous, veins, fascia and tips more or less fuscous .... *reticulata*

a. Pronotum black or fuscous with yellow markings.

b. Pronotum with yellow stripes or bands.

c. Pronotum with subapical band, lateral margins, and curved line behind each humeral, yellow.

d. Margins of head and spot each side of apex yellow. *gibbula*

dd. Head black with median stripe, median dorsal stripe and oblique band each side posterior process, yellow. var. *b* Stal

cc. Pronotum without subapical yellow band.

e. Median dorsal line, lateral margins in front, curved line behind each humeral, arcuate fascia near middle posterior process interrupted at middle, yellow. var. *c* Stal, *interrupta, bistrigata*

ee. Dorsum pronotum broadly yellow.

f. Vertex, median dorsal line, curved line above each humeral, large spot behind middle, and apex, brownish yellow .... *sellata*

ff. Dorsum pronotum mostly and point on each lateral margin yellow, apex and body blackish. *vertebralis*

bb. Pronotum without yellow bands or stripes, large spot above each humeral, another each side posterior process, yellow .... var. *d* *aa.* Pronotum yellow with black markings.

g. Head and pronotum ferruginous punctate, few small spots on metopidium, curved line each side behind humeral, fascia posteriorly, and apex, fusco-ferruginous; abdomen and legs testaceous ....var. *a* Stal

gg. Head and pronotum testaceous, shining, lateral margins and tip pronotum black ....*venosa*

List of Species

dispar Fabricius, Syst. Rhyng., p. 32, (1803). [Para, Brazil; Bugaba, Panama; Napo River, Ecuador; Kartabo, British Guiana].

bilinea Walker, List Hom. Brit. Mus. Suppl., p. 152, (1858). [Santarem, Brazil].

distinguenda Fowler, Biol. Cen.-Am. Hom., II, p. 91, pl. 7, fig. 21, (1895). Buckton, Mon. Memb., p. 161, pl. 32, fig. 11, (1903). [Central America; Mexico; Santarem, Brazil].

reticulata Fabricius, Syst. Rhyng., p. 29, (1803). Buckton, Mon. Memb., p. 161, pl. 12, fig. 12, (1903). Haviland, Zool., VI, p. 250, pl. 6, fig. 7, (1925). [Bugaba, David, Tolé, Panama; Kartabo, British Guiana; Blairmont, New Amsterdam, British Guiana; Napo River, Narangapata, Ecuador].

interrupta Fabricius, Syst., Rhyng., p. 31, (1803). [South America].

sellata Burmeister, Rev. Ent. Silb., VI, p. 183, (1836). [Surinam, Dutch Guiana].

bistrigata Fairmaire, Rev. Memb., p. 491, (1846). [Colombia; Puerto Cabello, San Esteban, Venezuela].

biguttata Fairmaire, Rev. Memb., pl. 7, figs. 10-11, (1846). [Brazil].

vertebralis Fairmaire, Rev. Memb., p. 491, (1846). [South America].

gibbula Fairmaire, Rev. Memb., p. 491, pl. 7, figs. 12-13, (1846). [Campos Geraes, Brazil].

venosa Walker, Ins. Saund. Hom., p. 76, (1858). [Unknown].

Genus **TYNELIA**

Stal, Of. K. Svenska Vet. Akad. F., XV, p. 250.

Key to Species

1 (6). Pronotum ferruginous to piceous without yellow markings.

2 (5). Apex posterior process blunt; elongate.

3 (4). Strongly pubescent; pronotum ferruginous or piceous; tegmina hyaline, spots on costa and tips with legs black. *prominens*

4 (3). Not pubescent; head pointed; pronotum shining brown, posterior process narrow; tegmina hyaline with coriaceous patches, veins and tips, with legs, brown ....*nitida*

5 (2). Posterior process pronotum gradually acuminate; tegmina hyaline, veins, basal median and apical spots, brown. *longula*

6 (1). Pronotum ferruginous or brown with yellow markings.

7 (10). Pronotum with transverse yellow band behind humerals, strongly hirsute, apex bluntly rounded; venation of tegmina black.

8 (9). Ocelli equidistant, below center of eyes; tegmina hyaline, two apical fuscous patches ....*cinctata*

9 (8). Ocelli equidistant, above center of eyes; pronotum greenish yellow from near base to middle joined posteriorly to transverse band; tegmina brown, some coraceous, central area narrowly hyaline ....*hirsuta*

10 (7). Pronotum without transverse yellow band near middle.

11 (12). Pronotum yellowish, front margin, marginal spot behind humerals ,and apical third posterior process, fuscoferruginous; dorsum straight; tegmina hyaline, short fascia and tips fuscous ....*pubescens*

12 (11). Pronotum ferruginous brown, humerals yellow margined, posterior process tectiform, depressed behind middle, yellow spot on middle each lateral margin; tegmina yellowish brown, semitransparent, a fuscous subapical spot. *globosa*

List of Species

prominens Walker, List Hom. Brit. Mus. Suppl., p. 151, (1858). [Santarem, Amazons, Brazil; Caldera, Chiriqui, Panama].

pubescens Stal, Hem. Fabr., II, p. 29, ♂, (1869). [Cayenne, Dutch Guiana].

nitida Funkhouser, Jour N. Y. Ent. Soc., XXX, p. 26, pl. 3, figs. 2, 25, (1922). [Napo River, Peru].

longula Burmeister, Handb. Ent., II, p. 143, (1835); and Rev. Ent. Silb., IV, p. 182, pl. 36, figs. 8-9, (1837). [Para, Prato, Brazil].

brunnea Funkhouser, Jour. N. Y. Ent. Soc., XXX, p. 26, pl. 3, fig. 3, (1922). [Para, Brazil].

cinctata Haviland, Zool., VI, p. 249, pl. 4, fig. 5, (1925). [Kartabo, British Guiana].

hirsuta Funkhouser, Jour. N. Y. Ent. Soc., XXX, p. 25, pl. 3, fig. 1, (1922). [Iquitos. Peru].

pubescens Fabricius, Syst. Rhyng., p. 29, (1803). [Cayenne, Dutch Guiana].

globosa Haviland, Zool., VI, p. 250, pl. 3, fig. 10, (1825). [Kartabo, British Guiana].

Genus VANDUZEA

Goding, Trans. Amer. Ent. Soc., XIX, p. 258. *Hypamastris* Fowler, Biol. Cen.-Am. Hom., II, p. 92.

Key to Species

1 (4). Pronotum green, testaceous or gray, pubescent, with brown markings.

2 (3). Pronotum testaceous anteriorly gradually changing to fuscous brown posteriorly, a whitish subapical band or spot, colors variable; tegmina more or less infuscate, fuscous spot on apical margin; body and legs testaceous, partly fuscous or sides black ....*segmentata*

3 (2). Pronotum green, pubescent, curved band each side behind humerals and subapical band white, brown spot behind each humeral; tegmina hyaline, veins brown punctate, tips slightly clouded; body and legs green, tarsi yellow. *punctipennis*

4 (1). Pronotum sordid white, pubescent, densely brown punctate, narrow band on front margin, margins humerals, broad stripe each side metopidium often confluent at middle dorsum then extended to lateral margins, and subapical band, brown; tegmina hyaline, median and apical spots fuscous, veins black; body and legs brown, legs marked with yellow ....*testudinea*

List of Species

segmentata Fowler, Biol. Cen.-Am. Hom., II, p. 93, pl. 6, fig. 23, (1895). Buckton, Mon. Memb., p. 162, pl. 32, fig. 14, (1903). [Chiriqui, Panama; Central America; Mexico; Texas; Arizona].

punctipennis Funkhouser, Jour. N. Y. Ent. Soc., XXVII, p. 275, (1919). [Cali, Colombia].

testudinea Haviland, Zool., VI, p. 251, pl. 3, fig. 5, (1925). [Kartabo, British Guiana].

Genus HYGRIS

Stal, Hemip. Rio Jan., II, p. 29. *Idioderma* Van Duzee, Bul. Buf. Soc. Nat. Hist., IX, p. 207.

Key to Species

1 (4). Pronotum with fuscous or brown markings.

2 (3). Rufo-testaceous; pronotum with large triangular spot above each humeral sinus, broad transverse band behind middle, and subapical band, pale; body and legs pale greenish ....*varia*

3 (2). Pale yellowish green, broadly brown anteriorly with few yellow dots, lunate band behind touching lateral margin each side and marks near apex, brown; body concolorous .... *picta*

4 (1). Pronotum without fuscous or brown markings.

5 (6). Length 7.5 mm.; pronotum yellow testaceous, pilose, slight median carina; tegmina hyaline, veins and apical nebulae fuscous .... *unicarinata*

6 (5). Length 4-5 mm.; pronotum green or yellowish with impunctata median line, not carinate; head rufous or scarlet; body concolorous sometimes spotted with carmine. . *virescens*

List of Species

varia VanDuzee, Bul. Buf. Soc. Nat. Hist., IX, p. 208, with fig., (1909). [Estero, Florida; Santiago de las Vegas, Cuba].

picta Osborn, An. Ent. Soc. Am., XIX, p. 360, (1926). [Baragua, Cuba].

unicarinata Stal, Hem. Rio Jan., II, p. 29, (1862). [Rio Janeiro, Brazil].

virescens VanDuzee, Bul. Buf. Soc. Nat. Hist., IX, p. 208, (1909). [Estero, Florida; Santiago de las Vegas, Bolondron, P. de Guanahacabibes, Cuba].

Genus **HEMIPTYCHA**

Germar, Rev. Ent. Silb., I, p. 177. *Hypselotropis* Stal, Hemip. Fabr., II, p. 26. *Gelastophara* Kirkaldy, Entomologist, XXXVII, p. 279.

Key to Species

One olivaceous species, median carina from base to summit, vitta each side toward humerals, and spot on tips tegmina, fuscous .... *obtecta*

List of Species

obtecta Fabricius, Syst. Rhyng., p. 13, (1803). [South America].

Genus **EROSNE**

Stal, Of. Vet. Ak. Forh., XXIV, p. 553, (1867).

Key to Species

One pale olivaceous yellow species, pronotum foliaceous, highly elevated in front, twice longer than high, humerals not prominent, median carina concolorous on metopidium, black posteriorly .... *bracteata*

List of Species

bracteata Stal, Bid. Memb. Kan., p. 240, (1869). [Surinam, Dutch Guiana; Para, Brazil].

Genus **LALLEMANDIA**

Funkhouser, Jour. N. Y. Ent. Soc., xxx, p. 33.

Key to Species

One brown very hairy species with two large rounded lobes each side of dorsum, broad black stripe anteriorly, short yellow line from middle each lateral margin, apex truncate much shorter than tegmina; tegmina smoky hyaline, tips largely brown; sides and chest white tomentose, abdomen sordid white...*nodosa*

List of Species

nodosa Funkhouser, Jour. N. Y. Ent. Soc., xxx, p. 33, pl. 3, fig. 10, (1922). [Kourou, French Guiana].

Tribe POLYGLYPTINI

Genus **ENTYLIA**

Germar, Rev. Ent. Silb., I, p. 178.

Key to Species

1 (4). Dorsum pronotum deeply sulcate front of middle, form or front elevation variable its summit usually truncate; pale yellow to black usually with one or two obliquely transverse whitish bands behind humerals.

2 (3). Second dorsal elevation nearly equal to height of front elevation its summit obtusely angular ....*carinata*

3 (2). Second dorsal elevation much lower than front elevation its summit broadly rounded; front elevation variable in altitude and form ....*gemmata*

4 (1). Dorsum without a sulcus, front elevation short, erect, quadrate, with two ridges each side, summit truncate, hind margin concave dorsum then gently sloping to apex; pronotum pale testaceous, pale brown anteriorly with several dots and short stripe brown; (the generic position of this species is doubtful) ....*areolata*

List of Species

carinata Forster, Nov. Spec. Ins. Cent., I, p. 67, (1771). Glover, MS Jour. Hom., pl. 1, fig. 26, (1878). [North America; Mexico; Central America, to Chiriqui, Panama].

sinuata Fabricius, Ent. Syst. Suppl., p. 513, (1798). Fairmarie, Rev. Memb., p. 300, pl. 5, fig. 29, (1846). Emmons, Agr. N. Y. Ins., v, p. 153, pl. 13, fig. 11, (1854). Matausch, Jour. N. Y. Ent. Soc., XVIII, p. 260, pl. 7, (1910). Howard, U. S. Ent. Bul., xxx, p. 75-78, figs. 27-28, (1902). Branch, Memb. Kan., pp. 75, 81, 107, figs. 61, 62, 64, 83, (1913). Brittain, Proc. Ent. Soc. Nova Scotia, p. 10, pl. 1, figs. 6.7, (1918). Buckton, Mon. Memb., p. 183, pl. 39, fig. 1, (1903). [Canada, United States].

emarginata Fabricius, Ent. Syst. Suppl., p. 513, (1798). Emmons, Agr. N. Y. Ins., v, p. 153, pl. 13, fig. 13, (1854). [New York].

bactriana Germar, Rev. Ent. Silb., I, p. 78, (1833), and III, p. 248, (1835). Fairmaire, Rev. Memb., p. 300, pl. 5, fig. 32, (1846). Funkhouser, Biol. Memb., pl. 29, figs. 11-12, (1917). [North America].

concisa Walker, List Hom. Brit. Mus., p. 547, (1851). Buckton, Mon. Memb., p. 183, pl. 39, fig. 2, (1903). Lawson, Kan. Univ. Sci. Bul., XIV, p. 90, pl. 6, figs. 5-6, (1922).

decisa Walker, List Hom. Brit. Mus., p. 548, (1851). [North America].

accisa Walker, List Hom. Brit. Mus., p. 548, (1851). [North America].

indecisa Walker, List Hom. Brit. Mus., p. 549, (1851). [North America].

reducta Walker, List Hom. Brit. Mus., p. 549, (1851). [North America].

torva Fitch, Cat. Hom. N. Y., p. 47, (1851). [New York].

impedita Walker, List Hom. Brit. Mus. Suppl., p. 137, (1858). [North America].

inequalis Butler, Cist. Ent., II, p. 211, pl. 3, fig. 7, (1878). [Central America].

mira Butler, Cist. Ent., II, p. 211, pl. 3, fig. 8, (1878). Fowler, Biol. Cen.-Am. Hom., II, p. 130, pl. 8, fig. 12, (1895). [North America; Mexico; Central America; Chiriqui, Panama].

concava Provancher, Pet. Fauna Can., III, p. 233, (1886). [Canada].

vittata Buckton, Mon. Memb., p. 184, pl. 39, fig. 6, (1903). [New York].

oedipus Buckton, Mon. Memb., p. 183, pl. 39, fig. 3, (1903). [Central America].

moesta Buckton, Trans. Ent. Lond., IX, p. 332, pl. 21, fig. 11, (1905). [Mexico].

fuscodorsa Buckton, Trans. Ent. Soc. Lond., IX, p. 332, fig. 10, (1905). [Unknown].

gemmata Germar, Mag. Ent., IV, p. 16, (1821). Fairmaire, Rev. Memb., p. 300, pl. 5, fig. 30, (1846). [Colombia; Patagonia; Chile; Rio Janeiro, Brazil; Caracas, Venezuela; Napo River, Tena, Baños, Narangapata, Ecuador].

corniculata Fairmaire, Rev. Memb., p. 300, pl. 5, fig. 31, (1846). [Caracas, Venezuela].

incisa Walker, List Hom. Brit. Mus., p. 548, (1851). [Brazil].

fallax Stal, Hem. Rio Jan., II, p. 28, (1862). [Rio Janeiro, Brazil].

turrita Butler, Cist. Ent., II, p. 212, pl. 3, fig. 9, (1878). [Rio Janeiro, Brazil].

?areolata Walker, Ins. Saund. Hom., p. 71, (1858). [Haiti].

Genus **POLYGLYPTA**

Burmeister, Handbuch der Entomologie, II, p. 142.

The twenty-nine forms described and redescribed as belonging to the genus *Polyglypta* have accumulated a synonymy upon which no two students agree, as no reliable characters are known for definitely separating them into true species. The form of the head, the length and direction of the anterior process, the number of lateral ridges, the shade and arrangement of the colors, are so variable that it is impossible with our present knowledge to satisfactorily separate any of them from *costata* the form first described. After a critical examination of more than 200 examples in the collection upon which the treatment of the genus in Biologia Centrali-Americana was based, together with the types of many of the described forms before him, Canon Fowler wrote: "After a very careful examination of the series before me I feel that, with the exception of a comparatively small percentage, they might all be arranged as forms of one species."

After years of work with hundreds of examples representing most of the so-called species, I am of opinion that there is but a single species with a multitude of forms varying in color pattern, dimensions, number of lateral carinae, and variable front process, the arrangement of which in tabular form would be wasted effort.

Burmeister described the species as follows: "Yellow, pronotum punctate, seven elevated costae, sides fusco-maculate, front horn fuscous beneath, yellow carinate. Long. 7.5 lines, lat. 1.25 lines. Chest and abdomen brown, flecked with yellow, forehead brown with five large and two small yellow flecks. Tegmina brown, margins yellow ....*costata*"

List of Species

costata Burmeister, Handb. Ent., II, p. 142, (1835), Rev. Ent. Silb., IV, p. 177, pl. 36, figs. 5-7, (1836). Buckton, Mon. Memb., p. 181, pl. 38, fig. 7, (1903). [Mexico; Central America; Bugaba, Panama; Baños, Huigra, Biblian, Azogues, Loja, Ecuador].

dorsalis Burmeister, Rev. Ent. Silb., IV, p. 178, (1836). Walker, List Hom. Brit. Mus., p. 543, pl. 4, fig. 3, (1851). Fowler, Biol. Cen.-Am. Hom., II, p. 124, pl. 8, fig. 5, (1895). [Mexico; Central America; Texas; Georgia].

maculata Burmeister, Rev. Ent. Silb., IV, p. 178, (1836). Buckton, Mon. Memb., p. 180, pl. 38, fig. 3, (1903). [Mexico; Bogota, Colombia; Savannah].
pallipes Burmeister, Rev. Ent. Silb., IV, p. 179, (1836). Buckton, Mon. Memb., p. 181, pl. 38, fig. 6, (1903). [Mexico].
lineata Burmeister, Rev. Ent. Silb., IV, p. 179, (1836). [Mexico].
sicula Amyot and Serville, Hemip., p. 541, (1843). [Mexico].
flavomaculata Amyot and Serville, Hemip. p. 541, pl. 9, fig. 9, (1843). [Savana].
pilosa Fairmaire, Rev. Memb., p. 296, (1846). [Mexico].
bogotensis Fairmaire, Rev. Memb., p. 397, (1846). Buckton, Mon. Memb., p. 182, pl. 38, fig. 9, (1903). [Bogota, Colombia].
nigriventris Fairmaire, Rev. Memb., p. 297, (1846). [Colombia].
viridimaculata Fairmaire, Rev. Memb., p. 298. [Colombia].
nigella Fairmaire, Rev. Memb., p. 298, (1846). [Mexico].
tredecim-costata Fairmaire, Rev. Memb., p. 299, (1846). [Mexico].
straminea Walker, List Hom. Brit. Mus., p. 544, (1851). [Colombia].
brevivitta Walker, List Hom. Brit. Mus., p. 545, (1851). [Venezuela].
interrupta Walker, List Hom. Brit. Mus., p. 545, (1851). [Colombia].
strigata Walker, List Hom. Brit. Mus. Suppl., p. 136, (1858). Buckton, Mon. Memb., p. 180, pl. 38, fig. 4, (1903). [Mexico].
abbreviata Walker, List Hom. Brit. Mus., p. 136, (1858). [Mexico].
reflexa Butler, Cist. Ent., II, p. 207, pl. 3, fig. 2, (1878). [Central America].
fusca Butler, Cist. Ent., II, p. 208, pl. 3, fig. 3, (1878). [Mexico].
hordeacea Butler, Cist. Ent., II, p. 309, pl. 3, fig. 4, (1878). [Para, Brazil].
tricolor Butler, Cist. Ent., II, p. 209, pl. 3, fig. 5, (1878). Buckton, Mon. p. 182, pl. 38, fig. 8, (1903). [Mexico; Peru].
godmani Distant, Ent. Mo. Mag., XVI, p. 11, (1880). [Central America].
nigridorsis Fowler, Biol. Cen. Am. Hom., II, p. 123, pl. 8, fig. 4, (1895). [Mexico; Central America].
major Fowler, Biol. Cen.-Am. Hom., II, p. 126, (1895). [Mexico].
dispar Fowler, Biol. Cen.-Am. Hom., II, p. 126, pl. 8, figs. 6-7, (1895). [Bugaba, Chiriqui, Panama].
aguae Fowler, Biol. Cen.-Am. Hom., II, p. 126, (1895). [Central America].
bucktoni Funkhouser, Cat. Memb., p. 324. [Doubtful].

Tribe SMILIINI

Genus **ADIPPE**

Stal, Bid. Memb. Syst., p. 55.

Key to Species

1 (2). Metopidium nearly erect forming a broadly obtuse angle with dorsum; pronotum green, yellow or brownish

with or without fuscous or black lines; free part of tegmina blackish, opaque.

a. Pronotum green with fuscous or black lines, front variegated.

b. Median carina fuscous, front black spotted .....*alliacea*

bb. Line on median carina forked at apical third the rami extended to each lateral margin, line each side from base curved above humeral to middle lateral margin, and median carina of apex, black ....*concinna*

aa. Pronotum greenish, grayish or brownish, sometimes variegated anteriorly with darker color. *inconspicua, inaequalis, grisea*

2 (1). Metopidium seen from side convex from base to apex; pronotum yellow with black spots, or black with yellow spots or stripes.

3 (6). Pronotum yellow or testaceous with transverse black dorsal bands or spots.

4 (5). Pronotum with base, transverse percurrent band at humeral sinus, another at middle abbreviated each side sometimes touching lateral margins, another percurrent on apical third, and apical spot, black; head and body frequently red ....*histrio*

5 (4). Pronotum with short oblique line each side from base, three transverse abbreviated bands on dorsum, sinuate subapical band, and two spots each side touching lateral margin, black; head yellow, body and legs brown....*pardalina*

6 (3). Pronotum black with yellow stripes or spots.

7 (8). Pronotum with yellow spots; metopidium yellow or red with two or three black longitudinal lines sometimes joined above and below, four large spots along dorsum and two large spots each side touching lateral margin, red or yellow or white; head, body and legs yellow or red....*zebrina*

8 (7). Pronotum black with yellow stripes and bands; head, arched line each side curved above humeral to middle lateral margin its highest point united by a transverse band, and another percurrent band joining ends of curved stripes, a subapical band emitting each side a short oblique stripe, yellow; legs black ....*testudo*

List of Species

alliacea Germar, Rev. Ent. Silb., III, p. 249, (1835). [Brazil].

concinna Fowler, Biol. Cen.-Am. Hom., II, p. 135, pl. 8, fig. 18, (1895). [Bugaba, Panama].

inconspicua Fowler, Biol. Cen.-Am. Hom., II, p. 135, pl. 8, fig. 19. [David, Panama].

inequalis Fowler, Biol. Cen.-Am. Hom., II, p. 136, pl. 8, fig. 20, (1895). [Bugaba, Chiriqui, Pena Blanca, Panama].

grisea Fowler, Biol. Cen.-Am. Hom., II, p. 136, (1895). [Bugaba, Panama].

histrio Walker, Ins. Saund. Hom., p. 71, (1858). Fowler, Biol. Cen.-Am. Hom., II, p. 135, pl. 8, fig. 17, (1895). [Mexico; Bogota, Colombia; Venezuela; Milagro, Cerro Manglaralto, Guayas, Rio Pescado, El Oriente, Ecuador].

mima Breddin, Soc. Ent., XVI, p. 60, (1901). [Ecuador].

ocellata Buckton, Mon. Memb., p. 188, pl. 40, fig. 5, (1903). [Rio Duga, Colombia].

fasciata Buckton, Mon. Memb., p. 189, pl. 40, fig. 7, (1903). [Rio Duga, Colombia].

pardalina Fowler, Biol. Cen.-Am. Hom., II, p. 134, pl. 8, fig. 16, (1895). [Chiriqui, Panama].

zebrina Fairmaire, Rev. Memb., p. 305, (1846). Fowler, Biol. Cen.-Am. Hom., II, p. 133, pl. 8, fig. 14, (1895). Buckton, Mon. Memb., p. 188, pl. 40, fig. 3, (1903). [Mexico; Central America; Venezuela].

figurata Walker, List Hom. Brit. Mus. Suppl., p. 137, (1858). [Mexico].

quadrivittata Stal, Bid. Memb. Kan., p. 234, (1869). [Ecuador].

maculata Distant, Ent. Mo. Mag., XVI, p. 11, (1879). [Central America].

vicina Fowler, Biol. Cen.-Am. Hom., II, p. 133, (1895). [Unknown].

haeretica Distant, Trans. Ent. Soc. Lond., p. 694, (1900). [Central America; Chiriqui, Panama].

maculata Fowler, Biol. Cen.-Am. Hom., II, p. 134, pl. 8, fig. 15, (1895). [Central America; Chiriqui, Panama].

concinna Buckton, Mon. Memb., p. 188, pl. 40, fig. 4, (1903). [Bugaba, Panama].

Fowler, Biol. Cen.-Am. Hom., II, p. 137. *Janthe* Stal, Bid. Hem. Syst.,

testudo Buckton, Mon. Memb., p. 188, pl. 40, fig. 6, (1903). [Bogota, Colombia].

Genus **ANTIANTHE**

Fowler, Biol. Cent.-Am., Hom. II, p. 137. *Janthe* Stal, Bid. Hem. Syst., p. 554. *Agondas* Kirkaldy, Entomologist, XXXV, p. 316.

Key to Species

1 (2). Length 6-7 mm.; green, yellow, or brownish, variegated with fuscous; dorsum with summit broadly rounded then gradually descending and lightly sinuate to apex which is slightly shorter than tips tegmina .... *expansa*

2 (1). Length 8-11 mm.; green to brown, often variegated and marked with fuscous; dorsum with summit very obtusely angulate then straight to apex which equals or is slightly longer than tips tegmina .... *foliacea*

List of Species

expansa Germar, Rev. Ent. Silb., ii, p. 245, (1835). Fairmaire, Rev. Memb., p. 309, pl. 5, figs. 6-7, (1846). Fowler, Biol. Cen.-Am. Hom., ii, p. 157, pl. 8, fig. 21, (1895). Buckton, Mon. Memb., p. 190, pl. 41, fig. 3, (1903). [Mexico; California; Florida; Arizona; Chiriqui, Panama; Bogota, Colombia; Vega Baja, Vega Alta, Cayey, Ciales, Bayamon, Corozal, Utado, Comerio, Porto Rica; Narangapata, Manglaralto, Guayas, Ecuador].

cucullata Burmeister, Handb. Ent., ii, p. 140, (1835). [Mexico].

humilis Fowler, Biol. Cen.-Am. Hom., ii, p. 138, (1895). [Mexico; Central America; Bugaba, Panama].

foliacea Stal, Stet. Ent. Zeit., xxv, p. 71, (1864). Buckton, Mon. Memb., p. 191, pl. 41, fig. 5, (1903). [Mexico; Central America; Brazil; Mt. Michel, Haiti; Mera, Narangapata, Manglaralto, Ecuador].

viridissima Walker, List Hom. Brit. Mus. Suppl., p. 138, (1858). Buckton, Mon. Memb., p. 191, pl. 41, fig. 7, (1903). [Mexico; Bogota, Colombia].

reversa Walker, Ins. Saund. Hom., p. 72. [Mexico].

Genus **CYRTOLOBUS**

Goding, Trans. Amer. Ent. Soc., xix, p. 257. *Cyrtosia* Fitch, Cat. Hom. N. Y., p. 49. *Cyrtoisa* Kirkaldy, Entomologist, xxxvi, p. 179.

Subgenus **ATYMNA** Stal

Key to Species

1 (2). Dorsum pronotum seen from side subarcuate, rounded in front; pronotum unicolorous greenish yellow, densely pilose; length 8 mm. .... *pilosa*

2 (1). Pronotum highly elevated in front, seen from side front margin vertical above head, summit sharply rounded then dorsum sloping straight to apex, a transverse ruga between scar above each eye; not pilose; pale sordid yellow veined and clouded with pale fuscous, median carina piceous with a narrow pale contiguous line each side; length 8 mm. *atromarginata*

List of Species

pilosa Funkhouser, Jour. N. Y. Ent. Soc., xxvii, p. 273, (1919). [Peru].

atromarginata Goding, Bul. Brook. Ent. Soc., xxiii, p. 137, (1928). [Cerro Manglaralto, Guayas, Ecuador].

Genus **OPHIDERMA**

Fairmaire, Revue des Membracides, p. 493.

Key to Species

1 (2). Dorsum pronotum flatly rounded from base; entirely yellow; tegmina clear hyaline; length 6 mm..... *planeflava*

2 (1). Dorsum pronotum bisinuate; pronotum dark brown, broad yellow transverse band behind humerals; tegmina hyaline, an oblique subapical brown band; length 3.6 mm. *fascipennis*

List of Species

planeflava Fairmaire, Rev. Memb., p. 306, (1846). [Brazil].
fascipennis Funkhouser, Jour. N. Y. Ent. Soc., XXVII, p. 274, (1919). [Bolivia].

Genus POLYRHYSSA

Stal, Hemip. Fabr., II, p. 26.

Key to Species

One unicolorous sordid yellow testaceous species, exterior free part tegmina concolorous basal half punctate ....*cultrata*

List of Species

cultrata Fabricius, in Coq. Ill. Icon. Ins., p. 77, pl. 18, fig. 4, (1801). [South America].

Genus METHEISA

Fowler, Biol. Cen.-Am. Hom., II, p. 132.

Key to Species

1 (2). Pronotum with or without a porrect front process, dorsum posterior process slightly convex; color variable, greenish to almost black, darker examples showing two pale bands; 4 to 5 mm. ....*lucillodes*

2 (1). Pronotum elevated above humerals and at middle posterior process, distinctly broadly concave between; length 4 to 7 mm.; color varies pale cinnamon to almost black. *cucullata*

List of Species

lucillodes Fowler, Biol. Cen.-Am. Hom., II, p. 132, pl. 8, fig. 13, (1895). Buckton, Mon. Memb., p. 185, pl. 39, fig. 7, (1903). [Bugaba, Chiriqui, Panama; Milagro, Ecuador].
cucullata Buckton, Mon. Memb., p. 186, pl. 39, fig. 8, (1903). [Unknown].

Genus HERANICE

Stal, Bid, Hem. Syst., p. 554.

Key to Species

One naviform species with numerous longitudinal ridges, varying in color from pale yellow to piceous irregularly marked with white, yellow, red or fuscous; tegmina almost covered (pl. X, fig. 1) ....*miltoglypta*

List of Species

miltoglypta Fairmaire, Rev. Memb., p. 306, pl. , figs. 4 and 12, (1846). Buckton, Mon. Memb., p. 194, pl. 42, figs. 3-4, (1903). Funkhouser, Jour. N. Y. Ent. Soc., xxii, p. 279, pl. 11, figs. 3-4, (1914), and Biol. Memb., pl. 31, fig. 26, (1917). [Bogota, Almaguer, Colombia; Baños, Cotopaxi, Azogues, Cañar, Ecuador].

Genus **POLYGLYPTODES**

Fowler, Biol. Cen.-Am. Hom., ii, p. 129.

Key to Species

1 (2). Dorsum pronotum straight from front horn to apical third then slightly sloping to apex; front horn porrect, color varies from pale yellow to fuscous (pl. x, fig. 4) *cornigerus*

2 (1). Dorsum pronotum convex from tip front horn to posterior apex; front horn extended forward and some downward; yellow, sometimes median carina and sides piceous. *scaphiformis*

List of Species

cornigerus Stal, Bid. Memb. Kan., p. 239, (1869). [Bogota, Colombia; Biblian, Ecuador].

cucullatus Fowler, Biol. Cen..Am. Hom., ii, p. 128, pl. 8, fig. 10, (1895). [Central America].

affinis Fowler, Biol. Cen.-Am. Hom., ii, p. 129, (1895). [Mexico].

flavocostatus Haviland, Zool., vi, p. 255, pl. 4, fig. 3, (1925). [Kartabo, British Guiana].

scaphiformis Fowler, Biol. Cen.-Am. Hom., ii, p. 129, pl. 8, fig. 11, (1895). [Central America; Milagro, Ecuador].

Genus **HILLE**

Stal, Bid. Hem. Syst., p. 555, (1867). *Oxygonia* Fairmaire, Rev. Memb., p. 301, (1846), (in part).

Key to Species

1 (4). Dorsum pronotum seen from side distinctly convex from behind front horn to posterior apex, usually dark brown band each side from summit horn to humerals; median carina black or concolorous.

2 (3). Front horn erect; pronotum pale green or yellow with or without a few obsolete raised lines each side; legs concolorous . . . . *exaltata*

3 (2). Front horn inclined obliquely forward; pronotum with several distinct carinae each side and on front horn; tegmina more or less infuscate, sometimes black, legs usually red. *erythropus*

4 (1). Dorsum pronotum seen from side nearly straight from summit front horn to posterior apex; pronotum yellow with several lateral carinae.

5 (6). Front horn erect, marked with black each side sometimes extended to humerals; body beneath black, legs yellow (a black variety with yellow legs has been recorded). *maculicornis*

6 (5). Front horn short, lightly inclined forward, more or less black which sometimes extends to humerals; abdomen red, legs yellow .... *rufiventris*

List of Species

exaltata Walker, List Hom. Brit. Mus. Suppl., p. 140, (1858). [Santarem, Brazil; Tena, Ecuador].

herbicola Haviland, Zool., VI, p. 225, pl. 4, fig. 1, (1925). [Kartabo, British Guiana].

erythropus Burmeister, Handb. Ent., II, p. 139, (1835). Fairmaire, Rev. Memb., p. 303, pl. 5, fig. 17, (1846). [Minas, Brazil; Palambamba, Pelileo, Mera, Baños, Loja, Ecuador].

atroaptera Fairmaire, Rev. Memb., p. 304, (1846). [Minas, Brazil].

altifrons Walker, List Hom. Brit. Mus., p. 553, (1851). [Brazil].

costigera Butler, Cist. Ent., II, p. 353, pl. 7, fig. 20, (1877). [Brazil].

sinuata Buckton, Mon. Memb., p. 186, pl. 40, fig. 1, (1903). [Brazil].

hirsuta Haviland, Zool., VI, p. 256, pl. 4, fig. 2, (1925). [Kartabo, British Guiana].

maculicornis Fairmaire, Rev. Memb., p. 303, pl. 5, fig. 20, (1846). Buckton, Mon. Memb., p. 193, pl. 42, fig. 2, (1903). [Bogota, Colombia; Tena, Ecuador].

notata Walker, Ins. Saund. Hom., p. 72, (1858). Stal, Bid. Memb. Kan., p. 235, (1869). [Rio Janeiro, Brazil; Bogota, Colombia].

rufiventris Germar, Mag. Ent., IV, p. 14, (1821). [Rio Janeiro, Brazil; Palabama, Loja, Ecuador].

signata Germar, Mag. Ent., IV, p. 15, (1821). [Brazil].

patruelis Stal (?), Hem. Rio Jan., II, p. 29, (1862). (Stal omits this species from his Key). [Rio Janeiro, Brazil].

Genus **ECUADORIA**

Goding, Bol. Med. Cir. Guay., XVIII, p. 31, (1921); Ent. News, XXXI. p. 136, (1921).

Key to Species

1 (4). Size large; head slightly shorter than broad between eyes; metopidium lengthily convex; first dorsal lobe situate behind humerals, sulcus between lobes deep concolorous; humerals large, auricular; abdomen black; no discoidal cell in corium.

2 (3). Pronotum olivaceous yellow, black punctured and clouded; dorsal lobes rounded at summits, second lobe some smaller, sides of sulcus seen from side oblique, hind margin posterior lobe straight; tegmina sordid hyaline, tips broadly smoky; legs infuscate ....*bicristata*

3 (2). Pronotum black, yellow mottled, lateral margins in front and apical third posterior process yellow with a few small black spots; dorsal lobes equal, summit of first lobe rounded, of second lobe truncate its hind margin sinuate, sulcus between seen from side with margins erect and parallel; basal two-thirds tegmina piceous with yellow points, apical third hyaline, interior half and tips infuscate; legs piceous ....*bactriana*

4 (1). About one-half size of its congenors, but variable; head long as broad between eyes; metopidium erect; first dorsal lobe situate above humerals, lobes equal summits rounded, sulcus between rather shallow but varying in depth and always broadly white, a white spot behind second lobe; basal two-thirds tegmina opaque, concolorous, large piceous spot on tips, one discoidal cell, four or five apical cells; color variable, pale brown mottled with yellow through piceous to black; abdomen and legs concolorous ....*fowleri*

List of Species

bicristata Stal, Bid. Memb. Kan., p. 238, (1869). Funkhouser, Jour. N. Y. Ent. Soc., xxii, p. 279, pl. 11, figs. 1-2, (1914). [Bogota, Almaguer, Colombia].

bactriana Goding, Bol. Med. Cir. Guay., xviii, p. 36, fig. 4, (1921). Rev. Col. Vic. Roc., p. 12, fig. 4, (1921); Ent. News, xxxi, p. 157, (1921). [Zunas, Chimborazo, Ecuador].

fowleri Funkhouser, Cat. Memb., p. 321, (1927). [Callanga, Peru].
sinuata Funkhouser, Can. Ent., xlvi, p. 362, pl. 24, fig. 6, (1914). [Callanga, Peru].

Genus **GELASTOGONIA**

Kirkaldy, Ent., xxxvii, p. 279, (1904). *Oxygonia* Fairmaire, Rev. Memb., p. 301, (1849), (in part). *Ennya* Stal, Berl. Ent. Zeit., x, p. 387, (1866).

Key to Species

1 (6). Dorsum bidentate.

2 (3). Front tooth a sharp slender spine, second tooth lower a rounded angle; anterior two-thirds pronotum black, apical third yellow, sometimes metopidium yellow, or pronotum entirely black, colors variable, legs yellow ....*chrysura*

3 (2). Sides front tooth parallel, summit truncate or rounded, second tooth triangular its summit acute; pronotum black or brown, metopidium convex to base first tooth; legs usually red .... *rufipes*

6 (1). Dorsum unidentate.

7 (8). Median carina wholly or partly black; dorsal crest between prominent humerals short, small, triangular; pronotum yellow, chest and abdomen black or fuscous. . *dorsalis*

8 (7). Median carina concolorous, not black.

9 (10). Humerals small, not produced, dorsal crest a rounded angle fuscous marked each side; body black....... *pacifica*

10 (9). Humerals strongly produced, large.

11 (16). Dorsal crest small, triangular.

12 (13). Pronotum testaceous red or yellow, brown between carinae; tegmina and legs reddish, body piceous.... *conica*

13 (12). Pronotum fuscous and yellow mottled.

14 (15). Abdomen dark fuscous; posterior pronotal process longer than tegmina .... *notata*

15 (14). Abdomen concolorous; posterior pronotal process hardly long as tegmina .... *conspersa*

16 (11). Dorsal crest high, front and hind margins about parallel, not triangular; pronotum pale brown with pale markings.

17 (18). Crest inclined obliquely forward, summit slightly angulate; median carina briefly pale near base, abdomen black marked .... *nutans*

18 (17). Dorsal crest erect, rather large, broad seen from side.

19 (22). Summit dorsal crest truncate; body yellow brown.

20 (21). Much larger; hind margin of crest oblique, not angulate near base, an oblique stripe from front base of crest to middle lateral margin each side, transverse band behind crest and its hind margin, ivory white .... *funkhouseri*

21 (20). Smaller; hind margin of crest vertical, a small angle at its base; two pale green spots each side on lateral margins, sometimes wanting .... *pulchella*

22 (19). Summit of crest rounded, white spot in front, another much elongated behind, apical part black; tegmina concolorous, large black spot on bases, legs yellow; size small. *gournellei*

List of Species

chrysura Fairmaire, Rev. Memb., p. 302, pl. 5, fig. 18, (1846). [Bogota, Colombia; Baños, El Oriente, Bucay, Ecuador].

auriflua Walker, List Hom. Brit. Mus., p. 550, pl. 4, figs. 1-2, (1851). [Venezuela].

fairmairei Breddin, Soc. Ent., XVI, p. 177, (1902). [Ecuador].

chlorozans Breddin, Soc. Ent., XVI, p. 177, (1902). [Ecuador].

nebulosa Breddin, Soc. Ent., XVI, p. 177, (1902). [Ecuador].

rufipes Fairmaire, Rev. Memb., p. 301, pl. 5, fig. 19, (1846). [Colombia; Peru].

dorsalis Fairmaire, Rev. Memb., p. 303, (1846). [Bogota, Colombia; Pichincha, Napo River, El Oriente, Ecuador].

venosa Walker, List Hom. Brit. Mus., p. 523, (1851). [Colombia].

sobria Walker, List Hom. Brit. Mus., p. 523, (1851). [Quito, Ecuador].

perfecta Walker, List Hom. Brit. Mus. Suppl., p. 139, (1858). [Napo River, Ecuador].

sulphurea Butler, Cist. Ent., II, p. 206, pl. 3, fig. 1, (1877).

pacifica Fairmaire, Rev. Memb., p. 302, (1846). [Rio Janeiro, Botofago, Brazil; Chiriqui, Panama; Ecuador].

sobrina Stal, Hem. Rio Jan., II, p. 28, (1862). [Rio Janeiro, Brazil].

fasciata Fallou, Rev. Ent., IX, p. 353, (1890). [Huigra, Ecuador].

ecuadorensis Fowler, Trans. Ent. Soc. Lond., p. 420, (1894). [Ecuador].

conica Fairmaire, Rev. Memb., p. 302, (1846). [Bogota, Colombia; Napo River, Ecuador].

reticulata Walker, List Hom. Brit. Mus., p. 524, (1851). [Colombia].

notata Stal, Bid. Memb. Kan., p. 235, (1869).

acuminata Buckton, Mon. Memb., p. 187, pl. 40, fig. 2, (1903). [Mozu, Brazil].

conspersa Stal, Bid. Memb. Kan., p. 236, (1869). [Bogota, Colombia].

nutans Stal, Bid. Memb. Kan., p. 236, (1869). [Bogota, Colombia; El Oriente, Ecuador].

funkhouseri Goding, Bul. Brook. Ent. Soc., XXIII, p. 138, (1928). [Huigra, Ecuador].

pulchella Funkhouser, Can. Ent., XLVI, p. 403, pl. 24, fig. 7, (1914). [Challanga, Peru].

gournelli Fallou, Rev. Ent., IX, p. 353, (1890). [Bahia, Brazil; Nequejahuiza, Bolivia].

Genus **MATURNA**

Stal, Bid. Hem. Syst., p. 555, (1867). *Lucilla* Stal, Bid. Hem. Syst., p. 555, (1867). *Dioclophara* Kirkaldy, Ent., XXXVII, p. 279, (1904).

Key to Species

1 (6). Dorsum pronotum highest front of middle; basal half tegmina opaque, coriaceous, concolorous.

2 (3). Long. 8 mm.; pronotum fuscous and yellow mottled, dorsum sinuate at middle and posteriorly a yellow spot in each sinus in darker forms; tips tegmina piceous, legs yellow (pl. XI, fig. 9) .... *ephippigera*

3 (2). Long. 6 mm. or less; pronotum pale green or yellow, also legs.

4 (5). Dorsum slightly angulate; abdomen black at middle. *viridula*

5 (4). Dorsum straight front of middle, compressed and strongly elevated, straight behind middle; pale fasciate posteriorly ....*mixta*

6 (1). Dorsum highest at or behind middle; basal half tegmina coriaceous, opaque, concolorous.

7 (8). Long. 7 mm.; anterior two-thirds dorsum almost horizontal then abruptly declines to posterior apex; pronotum brown to black with rufous markings or spot each side near middle and apical part median carina reddish, legs yellow brown ....*rufomaculata*

8 (7). Long. 6 mm. or less; dorsum more or less crested, or convex.

9 (12). Dorsum crested or feebly sinuate; long. 6 mm.

10 (11). Dorsum distinctly elevated in a crest; pronotum pale yellow with or without oblique ferruginous fascia near middle; chest and abdomen black, legs fusco-testaceous *subcristata*

11 (10). Dorsum nearly straight, feebly sinuate; pronotum testaceous yellow, chest and abdomen dark brown, legs yellow. *lloydi*

12 (9). Dorsum obtusely convex, not crested, lightly depressed anteriorly; pronotum greenish yellow, fusco-punctate or a pale subapical spot; body and legs concolorous; long. $3\frac{1}{3}$ mm. (pl. x, fig. 3) ....*parvula*

List of Species

ephippigera Fairmaire, Rev. Memb., p. 311, pl. 5, fig. 11, (1846). [Colombia; Chanaguerra, Baños, Ecuador].

lineosa Walker, Jour. Ent., I, p. 318, (1862). [Rio Janeiro, Brazil].

viridula Fairmaire, Rev. Memb., p. 305, (1846). [Bogota, Colombia].

mixta Stal, Bid. Memb. Kan., p. 239, (1869). [Colombia; Pelileo, Ecuador].

rufomaculata Fallou, Rev. Ent., IX, p. 353, (1890). [Ecuador].

intermedia Fowler, Trans. Ent. Soc. Lond., p. 421, (1894). [Ecuador].

subcristata Stal, Bid. Memb. Kan., p. 238, (1869). [Bogota, Colombia; Pelileo, Zamora, Ecuador].

lloydi Funkhouser, Jour. N. Y. Ent. Soc., XXII, p. 280, pl. 11, figs. 1-2, (1914). [Caqueta, Colombia; Pelileo, Baños, Chanaguerra, Ambato, Ecuador].

parvula Fabricius, Syst. Rhyng., p. 32, (1803). [Pelileo, Ecuador].

Tribe TELAMONINI

Genus **TELAMONA**

Fitch, Cat. Hom. N. Y. Cab., p. 50. *Telonaca* Ball., Proc. Biol. Soc. Wash., xxxi, p. 27.

Key to Species

1 (2). Dorsal process large, broad, rounded, situate just in front of middle, front margin abruptly declivous to dorsum leaving a level space behind metopidium; pronotum testaceous and brown variegated, median carina red; tegmina concolorous, veins red, body black ....*ruficarinata*

2 (1). Dorsal process triangular, front margin sloping from obtuse summit to basal margin, hind margin sloping to posterior apex, posterior process long, slender; tegmina entirely free, yellow hyaline, apex clavus black; pronotum yellow, ferruginous punctured and mottled; body yellow.*spinigera*

List of Species

ruficarinata Fowler, Trans. Ent. Soc. Lond., p. 421, (1894). [Bogota, Colombia].

spinigera Haviland, Zool., vi, p. 257, pl. 3, fig. 3, (1925). [Kartabo, British Guiana].

Genus **INCOLEA**

Goding, Jour. N. Y. Ent. Soc., xxxiv, p. 280.

Key to Species

1 (2). Entirely pale yellow and ferruginous variegated. *variegata*

2 (1). Greenish-yellow, base metopidium broadly piceous sometimes extending to middle of dorsum, bases tegmina ferruginous variegated, body and legs yellow..........*viridis*

List of Species

variegata Goding, Jour. N. Y. Ent. Soc., xxxiv, p. 280, (1926). [Tena, Napo River, Ecuador].

viridis Goding, Jour. N. Y. Ent. Soc., xxxiv, p. 280, (1926). [Tena, Napo River, Ecuador].

Genus **MENDICEA**

Goding, Jour. N. Y. Ent. Soc., xxxiv, p. 279.

Key to Species

One pale naviculate species clouded anteriorly with ferruginous, lateral carinae yellow, apical third median carina ferruginous; tegmina colorless hyaline, costal cell brown; chest, femora and tips tarsi piceous, abdomen pale yellow ....*scaphoidea*

List of Species

scaphoidea Goding, Jour. N. Y. Ent. Soc., p. 279, (1926). [Tena, Napo River, Ecuador].

Genus PHORMOPHORA

Stal, Hemip. Fabr., II, p. 28.

Key to Species

1 (6). Head elliptical, thrice wider than long, basal and apical margins nearly parallel; sinus at middle of dorsum; length 3-4.5 mm.

2 (5). Clypeus produced below margins genae; tegmina vitreous, free part opaque, coriaceous, bases punctate.

3 (4). Pronotum black or piceous, lateral margins posterior process broadly yellow usually leaving narrow black dorsal stripe; lateral margins head bisinuate, ocelli equidistant; free part tegmina entirely black; abdomen yellow, legs black .... *dorsata*

4 (3). Pronotum pale greenish-yellow without spots, fuscous punctate, sometimes lateral margins narrowly fuscous near apex; head piceous, clypeus strongly produced, broad, apex truncate, ocelli nearer to each other, lateral margins straight; basal half free part tegmina and tips translucent brown; chest and base abdomen black, legs yellow, tips tarsi black .... *spreta*

5 (2). Clypeus not produced below margins genae, apical margin slightly arcuate nearly parallel with basal margin, ocelli equidistant; pronotum black, often gradually turning posteriorly to dark ferruginous, small ferruginous spot behind each humeral; free part tegmina entirely black; abdomen and hind tarsi pale .... *maura*

6 (1). Head triangular, lateral margins sinuate, apex clypeus produced, truncate, ocelli nearer to each other; pronotum black, indistinct ferruginous cloud behind humerals, small spot behind each eye and lateral margins anteriorly bright yellow; dorsal sulcus front of middle .... *luteostriga*

List of Species

dorsata Fabricius, Syst. Rhyng., p. 31, (1803). [Tena, Ecuador].

spreta Goding, Jour. N. Y. Ent. Soc., xxxv, p. 170, (1927). [Mona, Jamaica; Tena, Ecuador].

maura Fabricius, Syst. Rhyng., p. 30, (1803). [Tena, Ecuador].

luteostriga Goding, Bul. Brook. Ent. Soc., xxiii, p. 139, (1928). [Tena, Ecuador].

Genus **APHETEA**

Fowler, Biol. Cen.-Am. Hom., ii, p. 94.

Key to Species

1 (4). Ocelli much nearer to eyes; clypeus not extended below margins genae.

2 (3). Tegmina hyaline, costal cell coriaceous, opaque, punctate, concolorous with pronotum, small black apical spot, veins distinct; pronotum pale green rarely obscure brown marks on apical lateral margins .... *affinis*

3 (2). Tegmina with basal two-thirds brown, coriaceous, opaque, punctate, veins indistinct; front half pronotum green, apical half dark brown a small green subapical spot and transverse brown line above each eye .... *maculata*

4 (1). Ocelli equidistant, basal margin sinuate.

5 (8). Clypeus large, wide as long, extended one-half below genae, tip rounded; humerals produced beyond line of eyes.

6 (7). Lateral margins head nearly straight; pronotum dull not shining, black with yellow markings, or yellow with or without black markings .... *bicolor*

a. Pronotum black, transverse band behind humerals and arcuate stripe each side from base to humerals yellow. var. *curvata*

b. Pronotum yellow, unicolorous ....var. *flava*

c. Pronotum yellow, two or three spots each side behind humerals ....var. *notata*

d. Pronotum yellow, anterior dorsal stripe, spots on lateral margins behind humerals, and posterior transverse band, black ....*strigata*

7 (6). Lateral margins head sinuate; pronotum dark reddish-brown, shining, without yellow markings ....*punctata*

8 (5). Clypeus small, not produced below genae, apex-head rounded from eyes; humerals not produced; pronotum brownish fuscous not shining, an obscure pale subapical band ....*inconspicua*

List of Species

affinis Haviland, Zool., vi, p. 252, pl. 3, fig. 4, (1825). [Kartabo, British Guiana; Tena, Ecuador].

maculata Funkhouser, Jour. N. Y. Ent. Soc., xxxv, p. 163, pl. 17, fig. 6, (1927). [Upper Rio Pachitea, Peru].

bicolor Goding, Jour. N. Y. Ent. Soc., xxxiv, p. 280, (1926). [Tena, Mira, Ecuador (including the above new color varieties)].

punctata Funkhouser, An. Mus. Zool. Acad. Sci. URSS, xxviii, p. 145, pl. 6, fig. 1, (1927). [Nalique, Brazil].

inconspicua Fowler, Biol. Cen.-Am. Hom., ii, p. 95, pl. 6, figs. 25-26, (1895). [Central America; Tena, Ecuador].

Genus **THRASYMEDES**

Kirkaldy, Entomologist, xxxvii, p. 279. *Phacusa* Stal, Stet. Ent. Zeit, xxv, p. 72.

Key to Species

1 (4). Pronotum black, shining, with yellow stripes.

2 (3). Pronotum with five yellow stripes on front, middle stripe extended three-fourths length of dorsum then forked, inner pair short, outer pair marginal looped; head and body testaceous; tegmina pale yellow hyaline ....*curvispina*

3 (2). Pronotum with lateral margins, vitta in front, sometimes subapical band, and lines on head, yellow; body black, legs yellow; tegmina black, yellow hyaline behind middle. *flavomarginata*

4 (1). Pronotum green or testaceous yellow, with or without dark markings.

5 (10). Tegmina with black or fuscous stripes.

6 (7). Pronotum pale testaceous, front broadly and apex castaneous or black; exterior margin tegmina entirely or partly fuscous ....*variata*

7 (6). Pronotum immaculate, extreme tip concolorous or black.

8 (9). Testaceous, shining, green on disk and at tip, tegmina with short oblique black stripe occupying discoidal and second apical cells ....*lineola*

9 (8). Green, extreme posterior tip pronotum black; tegmina hyaline, costa and apical veins black ....*nigricosta*

10 (5). Tegmina clear hyaline, tips rarely slightly infuscate. *pallescens*

List of Species

curvispina Walker, List Hom. Brit. Mus. Suppl., p. 152, (1858). [Santarem, Brazil].

flavomarginata Stal, Stet. Ent. Zeit., xxv, p. 72, (1864). Fowler, Biol. Cen.-Am. Hom., ii, p. 111, pl. 7, fig. 19, (1895). [Mexico].

variata Fowler, Biol. Cen.-Am. Hom., ii, p. 111, (1895). Buckton, Mon. Memb., p. 175, pl. 37, fig. 1, (1903). [Mexico; Central America; Azogues, Ecuador].

dubia Fowler, Biol. Cen.-Am, Hom., ii, p. 112, (1895). [Central America; Chiriqui, Panama].

nigricosta Goding, Trans. Am. Ent. Soc., lii, p. 109, (1926). [Baños, Ecuador].

lineola Walker, List Hom. Brit. Mus. Suppl., p. 146, (1858). Fowler, Biol. Cen.-Am. Hom., II, p. 112, pl. 7, fig. 21, (1895). [Mexico; Tena, Ecuador].

pallescens Stal, Bid. Memb. Kan., p. 247, (1869). Funkhouser, Jour. N. Y. Ent. Soc., XXII, p. 279, pl. 11, figs. 5-6, (1914). [Mexico; Caqueta, Colombia].

major Fowler, Biol. Cen.-Am. Hom., II, p. 111, pl. 7, fig. 20, (1895). [Central America].

Genus EURITEA

Stal, Bid. Hemip. Syst., p. 552.

Key to Species

1 (6). Pronotum testaceous-yellow or ferruginous, shining.

2 (5). Pronotum yellow-testaceous, with black markings.

3 (4). Median carina, and stripe on tips tegmina, black; venation concolorous .... *darnoides*

4 (3). Median carina concolorous; costa and radial veins corium, sometimes large spot on front pronotum, black. *personata*

5 (2). Pronotum ferruginous in front greenish-ferruginous posteriorly, apical part dark green, median carina, line each side base to base posterior process, lateral sinuous line, and submarginal line, white; tegmina with three discoidal cells (abnormal) and white fascia; body yellow...... *albifasciata*

6 (1). Pronotum black or blackish brown, shining.

7 (8). Pronotum uniform blackish-brown; white spot near bases tegmina; body fuscous .... *fasciata*

8 (7). Pronotum black, head and large spot on front ferruginous-red, spot on middle posterior process, and abdomen, yellow .... *munda*

List of Species

darnoides Walker, List Hom. Brit. Mus. Suppl., p. 140, (1858). [Constancia, Brazil].

personata Stal, Bid. Memb. Kan., p. 247, (1869). Fowler, Biol. Cen.-Am. Hom., II, p. 113, pl. 7, fig. 22, (1895). [Bogota, Almaguer, Colombia].

capitata Buckton, Mon. Memb., p. 175, pl. 37, fig. 3; and pl. 38, fig. 2, (1903). [Cachabe, Ecuador].

albifasciata Funkhouser, Jour. N. Y. Ent. Soc., XXX, p. 24, pl. 2, fig. 13, (1922). [Teffe, Brazil].

fasciata Buckton, Mon. Memb., p. 175, pl. 37, fig. 2, (1903). [Unknown].

munda Walker, List Hom. Brit. Mus. Suppl., p. 152, (1858). [Mexico; Central America].

nigripes Stal, Bid. Memb. Kan., p. 248, (1869). [Mexico].

Genus ACUTALIS

Fairmaire, Rev. Memb., p. 496.

Key to Species

1 (12). Pronotum black or brown, with or without pale markings.

2 (5). Posterior pronotal process with subapical pale band; abdomen yellow.

3 (4). Pronotum shining brown, black basal line, subapical band, margins head, yellow; tegmina clear hyaline; length 4 mm. .... *flavozonata*

4 (3). Pronotum dull black; subapical arcuate band white; tegmina yellow, pellucid; length 2 mm........ *retrofasciata*

5 (2). Posterior pronotal process without subapical pale band.

6 (7). Dull black, apex posterior process concolorous, small spot each side and margins head yellow; tegamina hyaline, bases black; tibiae pale .... *biguttula*

7 (6). Shining black, apex posterior process pale, not black.

8 (9). Tegmina colorless hyaline, veins brown; pronotum black, humerals, apex, abdomen, tibiae and tarsi pale yellow. *flaviventris*

9 (8). Tegmina more or less brown or black and opaque.

10 (11). Basal two-thirds tegmina blackish, more or less opaque, apical third clear hyaline, veins black; pronotum black, apex, margins at humerals, body and legs, yellowish, tarsi fuscous .... *tartarea*

11 (10). Tegmina hyaline with transverse brown band; pronotum dark brown, apex and small spot each side yellow. *tripunctata*

12 (1). Pronotum yellowish or greenish, with or without dark markings.

13 (16). Apex posterior pronotal process black.

14 (15). Pronotum immaculate except apex, or dark patch on disk; veins tegmina pale .... *terminalis*

15 (14). Pronotum with two transverse lines at base, three lines between humerals to middle dorsum, and line each side united front of apex, black; veins tegmina brown. .*litterata*

16 (13). Apex posterior pronotal process concolorous, not black; pronotum immaculate, or darker patch on disk; veins brown. *fusconervosa*

List of Species

flavozonata Fairmaire, Rev. Memb., p. 497, (1846). [Brazil].

retrofasciata Lethierry, An. Soc. Ent. Fr., p. 154, (1890). [San Esteban, Venezuela].

biguttula Fairmaire, Rev. Memb., p. 497, (1846). [Goyas, Brazil].

flaviventris Lethierry, An. Soc. Ent. Fr., p. 154, (1890). [Caracas, Venezuela].

tartarea Say, Jour. Acad. Nat. Sc. Phila., VI, p. 242, (1830). Branch, Memb. Kan., p. 102, figs. 18, 19, 80, (1913). Funkhouser, Biol. Memb., p. 237, pl. 25, fig. 20, (1917). Lawson, Memb. Kan., p. 62, pl. 5, figs. 5-6, (1922). [Canada; Huigra, Ecuador].

semicrema Provancher, Pet. Faun. Can., III, p. 235, (1886). [Canada].

tripunctata Fairmaire, Rev. Memb., p. 497, (1846). [Brazil; Caracas, Venezuela].

terminalis Walker, Ins. Saund. Hom., p. 76, (1858). [Brazil; Pichincha, Ecuador].

flavonervosa Buckton, Mon. Memb., p. 176, pl. 37, fig. 5, (1903). [Mexico].

litterata Fairmaire, Rev. Memb., p. 498, (1846). [Colombia].

fusconervosa Fairmaire, Rev. Memb., p. 498, (1846). [Colombia].

Genus **MICRUTALIS**

Fowler, Biol. Cen.-Am. Hom., II, p. 116.

Key to Species

1 (20). Pronotum black or piceous with or without pale markings.

2 (11). Tegmina more or less black or brown, coriaceous, opaque.

3 (4). Apex pronotum concolorous black, narrow lateral margins from base to humerals and broad transverse median band of head yellowish white; tegmina brown to piceous, broad oblique band near bases and apical third yellow hyaline; legs piceous, knees testaceous; 3 x 1.5 mm. Type: male; Tena, Napo River, Ecuador, (Williams), [Goding Collection]. Allotype: female; same data as type, [Goding Collection] .... **bella** new species

4 (3). Apex posterior pronotal process white or yellow.

5 (6). Tegmina shining black from bases to apical marginal vein, limbus only hyaline; head and except tip pronotum shining black .... *zeteki*

6 (5). Tegmina with at least apical third pale.

7 (10). Basal two-thirds tegmina black, opaque.

8 (9). Pronotum with broad green fascia from middle dorsum extended each side metopidium to base .... *viridicollis*

9 (8). Front of pronotum concolorous, sometimes margins at humerals, and subapical spot, yellowish .... *lugubrina*

10 (7). Bases tegmina briefly black and opaque; front half pronotum and of chest blackish-brown, apical half pronotum, most of tegmina, abdomen and legs, yellow; color variable .... *binaria*

11 (2). Tegmina hyaline, rarely tips infuscate.

12 (15). Apex pronotum concolorous, not pale.

13 (14). Pronotum entirely black, venation indistinct; smaller. *stipulipennis*

14 (13). Pronotum black, stripe each side from base united before apex, or interrupted on dorsum, venation distinct; larger .... *balteata*

15 (12). Apex pronotum pale yellow or white.

16 (17). Pronotum shining black except white apex, dorsum depressed; abdomen pale, chest blackish .... *calva*

17 (16). Pronotum black, with lines or spots pale.

18 (19). Pronotum shining, submarginal line each side from apex of head converging but not united front of apex; tegmina hyaline, veins darker .... *apicalis*

19 (18). Pronotum dull, margins and small spot near humerals, spot each side touching lateral margins, whitish; tegmina hyaline, veins indistinct .... *malleifera*

20 (1). Pronotum yellow, shining, with or without dark markings.

21 (28). Apex pronotum black.

22 (27). Posterior pronotal process with subapical band.

23 (26). Subapical pronotal band black or brown; tegmina hyaline.

24 (25). Pronotum with front margin, median line on metopidium and shorter line each side, black; venation distinct dark .... *nigrolineata*

25 (24). Pronotum with large spot anteriorly and apex black; veins tebmina pale .... *plagiata*

26 (23). Subapical band white, apex black; venation pale. *punctifera*

27 (22). Posterior process without subapical band, front margin, middle lateral margins and apex pronotum, chest and legs blackish, knees pale; tegmina fusco-irrorate except tips. *geniculata*

28 (21). Apex posterior process concolorous, not black.

29 (30). Pronotum testaceous to brownish-testaceous with pale yellow lines of fuscous spot anteriorly, very variable. *ephippium*

30 (29). Pronotum with three broad lines between humerals united at middle dorsum and extends nearly to posterior apex, and base metopodium with short median and oblique line each side, black; tegmina pale yellow hyaline, veins indistinct .... *melanogramma*

List of Species

bella Goding, in this Key. [Tena, Napo River, Ecuador].

zeteki Goding, Bul. Brook. Ent. Soc., XXIII, p. 139, (1928). [Narangapata, Ecuador; Panama].

viridicollis Fowler, Biol. Cen.-Am. Hom., II, p. 118, pl. 8, fig. 2, (1895). [Bugaba, Panama; Tena, Ecuador].

lugubrina Stal, Hem. Rio Jan., II, p. 32, (1862). [Rio Janeiro, Brazil; Huigra, Ecuador].

dubia Fowler, Biol. Cen.-Am. Hom., II, p. 119, (1895). [Chiriqui, Panama].

parallela Fowler, Biol. Cen.-Am. Hom., II, p. 120, (1895). [Central America].

albivitta Fowler, Biol. Cen.-Am. Hom., II, p. 121, (1895). [Mexico].

binaria Fairmaire, Rev. Memb., p. 497, (1846). [Colombia; Baños, Tena, Rio Pescado, Narangapata, Victoria, Bucay, Huigra, Ecuador; Mexico; Central America].

latifrons Walker, List Hom. Brit. Mus., p. 588, (1851). [Colombia].

semipallida Stal Hem. Rio Jan., II, p. 32, (1862). [Rio Janeiro, Brazil].

semialba Stal, Hem. Rio Jan., II, p. 32, (1862). [Rio Janeiro, Brazil].

mutabilis Fowler, Biol. Cen.-Am. Hom., II, p. 117, (1895). [Mexico; Central America].

stipulipennie Buckton, Mon. Memb., p. 178, pl. 37, fig. 10, (1903). [Unknown].

minutus Buckton, Mon. Memb., p. 178, (1903). [Cachabe, Ecuador].

balteata Fairmaire, Rev. Memb., p. 496, pl. 7, fig. 17, (1846). Buckton, Mon. Memb., p. 177, pl. 37, fig. 7, (1903). [Colombia, Baños, Huigra, Ecuador; Chiriqui, Panama; Central America].

trigona Walker, List Hom. Brit. Mus., p. 587, (1851). [Colombia].

calva Say, Jour. Acad. Nat. Sci. Phila., VI, p. 242, (1830). Glover, MS Jour. Hom., pl. 1, fig. 3, (1878). Funkhouser, Biol. Memb., pl. 25, fig. 18, (1917). [North America; Dominica, West Indies; Santiago de las Vegas, Camaguay, Mancanillo, L. de Ariguamavo, Pico Turquina, Cuba; Narangapata, Tena, Bucay, Baños, Napo River, Huigra, Ecuador].

flavipennis Fairmaire, Rev. Memb., p. 497, (1846). [United States of America].

moesta Stal, Hem. Rio Jan., II, p. 33, (1862). [Rio Janeiro, Brazil].

apicalis Goding, Can. Ent., xxv, p. 53, 1893). [St. Vincent, West Indies; New Amsterdam, British Guiana].
malleifera Fowler, Biol. Cen.-Am. Hom., II, p. 118, pl. 8, fig. 1, (1895). [Mexico; New Amsterdam, Blaimont, British Guiana].
nigrolineata Stal, Stet. Ent. Zeit., xxv, p. 72, (1864). [Mexico; Bogota, Colombia].
plagiata Stal, Hem. Rio Jan., II, p. 32, (1862). [Rio Janeiro, Brazil].
punctifera Walker, List Hom. Brit. Mus. Suppl., p. 153, (1858). [Constancia, Brazil].
geniculata Stal, Hem. Rio Jan., II, p. 32, (1862). [Rio Janeiro, Brazil].
ephippium Burmeister, Rev. Ent. Silb., IV, p. 191, (1836). [Mexico; Central America; Tena, Ecuador].
  modesta Stal, Hem. Rio Jan., II, p. 32, (1862). [Rio Janeiro, Brazil; Caracas, Venezuela].
  variabilis Berg, Hemip. Argent., p. 244, (1879). [Buenos Aires, Argentina; Uruguay].
  lucidus Buckton, Mon. Memb., p. 177, pl. 37, fig. 6, (1903). [Bolivia].
melanogramma Perty, Del. An. Art., p. 178, pl. 35, fig. 10, (1834). [Piauhy, Brazil; New Amsterdam, Blairmont, British Guiana].
  trifurcata Goding, Can. Ent., xxv, p. 53, (1893). [St. Vincent, West Indies].

Pending the examination of a long series of the described forms with so far as possible the types in hand, it is possible to separate them only by noting the variations in the arrangement of colors—a most unsatisfactory method. All students of this group agree that a large number of the so-called species are but color varieties of *ephippium*.

Subfamily TRAGOPINAE

Corium with no discoidal cells:

Tribe HORIOLINI

Genus **HORIOLA**

Fairmaire, Revue des Membracides, p. 492.

Key to Species

1 (2). Pronotum pale yellow to black with more or less distinct curved stripes or bands forming a cross; the more typical forms have an oblique white stripe extended each side from basal margin to meet at middle of dorsum, another arcuate white stripe each side from humeral to middle of lateral margin, and one or two white bands and stripes

towards apex; the white stripes and bands are often margined with black; tegmina frequently black or brown with one or two hyaline areas, or apices yellow hyaline; body usually black, legs yellow. The design and strength of coloring greatly varies, some being entirely black, others mostly grayish, still others irrorate. In a series of nearly 200 examples they pass gradually from the black forms through the typically colored to forms almost entirely gray ...*picta*

2 (1). Pronotum ferruginous or yellowish-brown, with one or two transverse white bands each side towards apex, and sometimes a yellowish-white oblique line from each humeral towards the middle of dorsum; tegmina usually concolorous, more or less coriaceous and opaque, with one or two clear hyaline stripes; body concolorous, tarsi yellow; (possibly a variety of *picta*) ....*ferruginea*

List of Species

picta Stoll, Cig., p. 66, pl. 16, fig. 89, (1788). Fabricius, in Coquebert Ill. Icon. Ins., p. 78, pl. 18, fig. 10, (1801). Buckton, Mon. Memb., p. 158, pl. 32, fig. 9, (1903). Guerin, Reg. An. Ins., pl. 98. fig. 2, (1838). [Surinam, Dutch Guiana; Trinidad; Para, Rio Janeiro, Rio Negro, Caroeviro, Brazil; Bolivia; Blairmont, British Guiana; Tena, Mera, Ana Maria, Napo River, Narangapata, Ecuador].

arcuata Fabricius, Syst. Rhyng., p. 29, (1803). Fowler, Biol. Cen.-Am., p. 86, pl. 8, fig. 20, (1895). Buckton, Mon. Memb., p. 158, pl. 32, fig. 8, (1903). [Bogota, Colombia; Taboga Island; Bugaba, David, Chiriqui, Panama; Kartabo, British Guiana].

lineola Fabricius, Syst. Rhyng., p. 30, (1803). [South America].

strigosa Fabricius, Syst. Rhyng., p. 30, (1803). [South America].

glabrata Fabricius, Syst. Rhyng., p. 31, (1803). [South America].

elegantula Perty, Del. An. Art., p. 178, pl. 35, fig. 11, (1830). [Brazil].

andrae Burmeister, Rev. Ent. Silb., IV, p. 190, (1836). [Para, Brazil].

chi Burmeister, Rev. Ent. Silb., IV, p. 190, (1836). [Para, Brazil].

lineolata Fairmaire, Rev. Memb., p. 492, (1846). [Cayenne, Dutch Guiana; Parintius, Brazil].

composita Walker, List Hom. Brit. Mus., p. 587, (1851). [Venezuela].

ferruginea Fairmaire, Rev. Memb., p. 493, (1846). [St. Paul, Brazil; Bolivia; Kartabo, British Guiana; Tena, Ecuador].

strigulose Walker, List Hom. Brit. Mus. Suppl., p. 153, (1858). [Santarem, Brazil].

fenestrata Funkhouser, Jour. N. Y. Ent. Soc., XXX, p. 20, pl. 2, fig. 8, (1922). [Flores, Manaos, Brazil; Iquitos, Yurimagus, Peru].

Corium with one or more discoidal cells:

Tribe TRAGOPINI

Genus **TRAGOPA**

Latrielle, Reg. Anim., v, p. 219. *Chelyoidea* Buckton, Mon. Memb., p. 156.

Key to Species

1 (36). Pronotum not longer than broad between tips of humerals.

2 (21). Pronotum with a median carina or smooth line; humerals large.

3 (10). Surface of pronotum punctured, opaque, not shining.

4 (5). Dorsum with smooth median line not elevated; black, lateral lobes, lateral margins at posterior angles narrowly, and legs, ferruginous-yellow ....*morio*

5 (4). Dorsum with a strong median carina.

6 (7). Testaceous sometimes brown-irrorate, front of pronotum including humerals more or less black or brown, body brown or black, legs more or less yellow ....*cimicoides*

7 (6). Pronotum with bands or stripes.

8 (9). Brown with three transverse testaceous dorsal bands, body black, legs testaceous; humerals carinate above. *auriculata*

9 (8). Orange-yellow, broad transverse band between the humerals occupying front half, arcuate stripe each side on lateral margins behind humerals, black; body and hind tibiae brown, other tibiae yellow; posterior process tectiform, apical margin rounded ....*fasciata*

10 (3). Surface of pronotum minutely punctulate, shining, smooth.

11 (20). Pronotum black or brown, with or without yellow markings.

12 (13). Humerals large, produced, auriculate, median carina distinct; immaculate brown; apex subtruncate...*peruviana*

13 (12). Humerals angulate, nor prominently produced, median carina obsolete.

14 (15). Pronotum black, immaculate or posterior margin very narrowly testaceous; body and legs piceous or ferruginous. *aenea*

15 (14). Pronotum black or brown with yellow markings.

16 (17). Front half pronotum black or brown with testaceous points; hind half testaceous with or without brown spot in front; head body and legs testaceous ....*dimidiata*

17 (16). Pronotum with yellow spots.

18 (19). Dorsum with about a dozen annular spots, and femora, testaceous-red; posterior process tectiform, apex rounded. *annulata*

19 (18). Dorsum with two spots posteriorly, median line obsoletely and tarsi yellowish; apex strongly carinate. . *pumicata*

20 (11). Pronotum fuscous-yellow, black punctulate, large spot between humerals sometimes occupying anterior part or divided, and broad transverse dorsal band rarely interrupted at middle, or jointed to anterior spot, black. *marmorea*

21 (2). Pronotum destitute of median carina or smooth line.

22 (25). Surface of pronotum punctured, opaque, not shining.

23 (24). Pronotum black, posterior margin narrowly ferruginous; humerals angulate, moderately produced. . . *fenestrata*

24 (23). Pronotum brownish-yellow, blackish on dorsum and anteriorly, testaceous below humerals; body dark brown, legs testaceous; apex rather acuminate .... *funerula*

25 (22). Surface of pronotum smooth, shining, finely punctulate, black or brown.

26 (27). Pronotum immaculate, rarely posterior margin yellow; body and legs reddish; humerals prominent ...... *bucktoni*

27 (26). Pronotum with yellow markings.

28 (29). Anterior two-thirds pronotum brown, posterior third yellow, a line and point at middle and two points on lateral margins brown; body and legs brown; humerals not prominent .... *bipartita*

29 (28). Pronotum black with yellow spots.

30 (33). Surface pronotum sprinkled with ferruginous or white.

31 (32). Pronotum sprinkled with white points; head and legs testaceous .... *punctatissima*

32 (31). Pronotum with arcuate stripe each side from humerals, and apex, pale; head yellow with black spot; humerals rather prominent; apex dilated, fusco-irrorate. . . . . *bajulus*

33 (30). Pronoton not irrorate.

34 (35). Pronotum with several small yellow spots, number variable, head sometimes yellow; body and legs brown or yellow. *coccinella*

35 (34). Pronotum with broad oblique spot on each humeral almost reaching dorsal line, spot under each humeral, four spots forming a subapical band sometimes united, two apical spots, and head, orange-yellow; body and legs brown. *dohrni*

74 (71). Pronotum black, white spot at base metopidium or absent; head black, red spot between eyes ....*frontalis*

75 (64). Pronotum sordid white spotted with brown, sparingly hairy, with transverse band behind humerals, large triangular subapical spot each side, and apex, brown; head and legs yellow, tarsi black, body brown ....*guianae*

76 (63). Surface of pronotum smooth, shining.

77 (92). Black or brown.

78 (81). Pronotum immaculate black.

79 (80). Head, body and legs rusty black ....*occulta*

80 (79). Head, body and legs red, rarely apical margin very narrowly testaceous ....*cyanea*

81 (78). Pronotum black or brown, with white or yellow markings.

82 (83). Pronotum black, head, apical part posterior process, and front legs, testaceous-yellow ....*gilviceps*

83 (82). Pronotum with lines, and with or without spots, white or ferruginous.

84 (87). Pronotum with one whitish or ferruginous line each side.

85 (86). Posterior process with oblique line each side, and large variegated spot posteriorly, ferruginous ....*fulvovaria*

86 (85). Pronotum brown, short irregular whitish line from middle lateral margin each side; apex obtuse........*albifascia*

87 (84). Pronotum with two lines each side behind humerals and dots on dorsum white or yellow.

88 (91). Brown, dorsum with small yellow or white spots.

89 (90). Posterior process with arcuate line and short straight line each side behind humerals, and several small spots on dorsum, white; body and legs yellow; apex acute. *maculidorsa*

90 (89). Dorsum with crescent-shaped row small dots connecting humerals united below to form a short fascia each side near humerals, and behind this numerous small dots also united into a short band touching lateral margin each side, yellow; apex obtuse; body and legs yellow, tarsi brown. *decorata*

91 (88). Black, dorsum without yellow or white spots; posterior process with two short parallel white lines from near middle lateral margins each side, apex acute; body black, legs pale. *ovalis*

92 (77). Pronotum reddish-testaceous or yellowish.

93 (96). Pronotum reddish.

94 (95). Immaculate pale red, testaceous posteriorly, apex rounded; head triangular, base straight, ocelli minute. *tetyrides*

95 (94). Brilliant yellowish-red, long oval spot from basal margin to middle of dorsum, small spot behind humerals, and apical third, shining black, obtuse ....*bicolor*

96 (93). Pronotum testaceous, transverse band behind humerals, with or without median stripe in front, fuscous.*nitidula*

List of Species

As a number of the described species of this tribe are unknown to the writer, three of the subgenera of Stal have not been utilized here; a thorough revision of the genus *Tragopa* with all the species in hand may require a different arrangement of them. As placed by Stal those preceded by * were in his subgenus *Tragopa*, by † in his subgenus *Tropidolomia*, and by‡ in his subgenus *Stilbophora*.

***morio** Fabricius, Syst. Rhyng., p. 26, (1803). [South America].

***cimicoides** Fabricius, in Coquebert Ill. Icon. Ins., II, pl. 18, fig. 6, (1801). Fairmaire, Rev. Memb., p. 485, pl. 7, fig. 1, (1801). Burmeister, Rev. Ent. Silb., IV, p. 185, pl. 36, figs. 10-12, (1836). [Guiana; Santarem, Para, Brazil; Tena, Mera, Napo River, Ecuador].

**melanostigma* Perty, Del. An. Art., p. 178, pl. 35, fig. 13, (1834). [Rio Negro, Brazil].

bifacies Walker List Hom. Brit. Mus. Suppl., p. 150, (1858). [Villa Nova, Brazil].

maculata Funkhouser, Jour. N. Y. Ent. Soc., XXX, p. 22, pl. 2, fig. 11, (1922). [Para, Brazil].

parishi Funkhouser, Cat. Memb., p. 177, (1927). [Para, Brazil].

‡**auriculata** Stoll, Cig. p. 40, pl. 8, fig. 38, (1788). [Cayenne, Surinam, Dutch Guiana].

†*vespertilio* Fabricius, Syst. Rhyng., p. 26, (1803). [Brazil].

fasciata Funkhouser, Jour. N. Y. Ent. Soc., XXX, p. 21, pl. 2, figs. 9-10, (1922). [Para, Brazil].

peruviana Funkhouser, Cat. Memb., p. 177, (1927). [Napo River, Peru].

brunnea Funkhouser, Jour. N. Y. Ent. Soc., XXX, p. 23, pl. 2, fig. 12, (1922). [Napo River, Peru].

aenea Perty, Del. An. Art., p. 179, pl. 35, fig. 12, (1834). [Piauhy, Brazil].

**nitida* Germar, Rev. Ent. Silb., III, p. 309, (1835). [Brazil].

***dimidiata** Fairmaire, Rev. Memb., p. 487, (1846). [Cayenne, Dutch Guiana; U. S. A.].

***annulata** Fabricius, Syst. Rhyng., p. 27, (1803). [Ega, Brazil].

***pumicata** Stal, Hem. Rio Jan., ii, p. 31, (1862). [Rio Janeiro, Brazil].

marmorea Fairmaire, Rev. Memb., p. 486, (1846). [Chiquita, Colombia].

fenestrata Walker, List Hom. Brit. Mus. Suppl., p. 151, (1858). [Santarem, Brazil; Tena, Ecuador].

**lata* Stal, Bid. Memb. Kan., p. 231, (1869). [Guiana; South America].

funerula Fairmaire, Rev. Memb., p. 488, (1846). [Cayenne, Dutch Guiana].

triangulata Buckton, Trans. Ent. Soc. Lond., ix, p. 331, pl. 21, fig. 6, (1905). [Unknown].

bucktoni Funkhouser, Cat. Memb., p. 172, (1927). [St. Pauls, Amazons, Brazil; Iquitos, Peru].

nitida Buckton, Mon. Memb., p. 156, pl. 33, fig. 2, (1903). [St. Pauls, Amazons, Brazil; Iquitos, Peru].

bipartita Fairmaire, Rev. Memb., p. 487, (1846). [Cayenne, Dutch Guiana].

punctatissima Fairmaire, Rev. Memb., p. 486, (1846). [Cayenne, Dutch Guiana].

***bajulus** Germar, Rev. Ent. Silb., iii, p. 309, (1835). [Rio Janeiro, Brazil].

coccinella Fairmaire, Rev. Memb., p. 486, (1846). [Chiquita, Colombia; Santarem, Brazil].

**maculata* Stal, Bid. Memb. Kan., p. 231, (1869). [Bogota, Colombia].

dohrni Fairmaire, Rev. Memb., p. 487, pl. 7, fig. 3, (1846). [Santa Cruz-Bahia, Sontarem, Teffe, Brazil].

†alacris Burmeister, Rev. Ent. Silb., iv, p. 186, (1836). [Para, Brazil].

†gibberula Stoll, Cig., p. 62, pl. 15, fig. 81, (1788). [Surinam, Dutch Guiana].

†*obliqua* Germar, Mag. Ent., iv, p. 13, (1821). [Brazil].

discrepans Walker, List Hom. Brit. Mus. Suppl., p. 150, (1858). [Santarem, Prata, Brazil; Napo River, Ecuador].

scutellaris Buckton, Mon. Memb., p. 156, pl. 33, fig. 1, (1903). [Amazons, Brazil].

†sacrata Burmeister, Rev. Ent. Silb., p. 186, (1836). [Para, Bahia, Brazil].

†bistriata Burmeister, Rev. Ent. Silb., iv, p. 188, (1836). [Para, Brazil; Tena, Ecuador].

zebra Goding, Bul. Brook. Ent. Soc., xxiii, p. 141, (1928). [Tena, Ecuador].

globus Germar, Mag. Ent., iv, p. 12, (1821). [Rio Janeiro, Brazil].

glabra Latrielle, Anim. King., p. 177, (1836). [Unknown].

irrorata Goding, Bul. Brook. Ent. Soc., xxiii, p. 141, (1928). [Tena, Ecuador].

†involuta Fabricius, in Coquebert Ill. Icon. Ins., ii, p. 78, pl. 18, fig. 7, (1801). [Brazil; Surinam, Dutch Guiana].

longa Funkhouser, Jour. N. Y. Ent. Soc., xxx, p. 17, pl. 2, fig. 5, (1922). [Challanga, Peru; Tena, Ecuador].

‡xanthocephala Germar, Mag. Ent., iv, p. 14, (1821). [Bahia, Brazil].

bugabensis Fowler, Biol. Cen.-Am. Hom., ii, p. 85, pl. 6, fig. 19, (1895). [Bugaba, Panama].

insignis Fowler, Biol. Cen.-Am. Hom., II, p. 85, pl. 6, fig. 18, (1895). [Bugaba, Panama; Tena, Ecuador].

brunneimaculata Funkhouser, Jour. N. Y. Ent. Soc., XXX, p. 18, pl. 2, fig. 6, (1922). [Bolivia].

pubescens Funkhouser, Jour. N. Y. Ent. Soc., XXX, p. 17, pl. 2, fig. 4, (1922). [Iquitos, Peru].

obesa Goding, Bul. Brook. Ent. Soc., XXIII, p. 141, (1928). [Tena, Ecuador].

albimacula Germar, Mag. Ent., IV, p. 14, (1821). [Brazil].

humeralis Fairmaire, Rev. Memb., p. 489, (1846). [Brazil].

luteimaculata Funkhouser, Can. Ent., XLVI, p. 406, pl. 24, fig. 11, (1914). [Peru; Tena, Napo River, Ecuador].

frontalis Fairmaire, Rev. Memb., p. 489, pl. 7, fig. 2, (1846). [Minas, Brazil].

guianae Haviland, Zool., VI, p. 247, pl. 3, fig. 2, (1925). [Kartabo, British Guiana].

occulta Haviland, Zool., VI, p. 248, pl. 3, fig. 1, (1925). [Kartabo, British Guiana; Tena, Ecuador].

***cyanea** Burmeister, Rev. Ent. Silb., IV, p. 189, (1836). [Para, Brazil; Tena, Ecuador].

‡gilviceps Stal, Hem. Rio Jan., II, p. 31, (1862). [Rio Janeiro, Brazil].

fulvovaria Fairmaire, Rev. Memb., p. 488, (1846). [Brazil].

albifascia Funkhouser, Jour. N. Y. Ent. Soc., XXX, p. 16, pl. 2, fig. 3, (1922). [Bolivia].

maculidorsa Funkhouser, Jour. N. Y. Ent. Soc., XXX, p. 19, pl. 2, fig. 7, (1922). [Bolivia; Tena, Mira, Ecuador].

decorata Funkhouser, Can. Ent., XLVI, p. 406, pl. 24, figs. 12-13, (1914). [Bolivia].

ovalis Burmeister, Rev. Ent. Silb., IV, p. 188, (1836). [Para, Brazil].

tetyrides Walker, List Hom. Brit. Mus., p. 580, pl. 4, fig. 6, (1851). [British Guiana Napo River, Ecuador].

bicolor Goding, Bul. Brook. Ent. Soc., XXIII, p. 142, 1928). [Tena, Ecuador].

‡nitidula Fabricius, Syst. Rhyng., p. 31, (1803). [South America].

‡*seminulum* Fabricius, Syst. Rhyng., p. 32, (1803). [South America].

‡*tripartita* Fairmaire, Rev. Memb., p. 490, (1846). [Cayenne, Dutch Guiana].

Genus **CERATOPOLA**

Stal, Bidrag Memb. Kan., p. 232.

Key to Species

1 (2). Pronotum black, one-half longer than broad between humerals, an oblique longitudinal line each side and spot on disk posterior process, yellow; head black, basal horns longer than broad, conical, porrect ....*corniculata*

2 (1). Pronotum black, one-fourth longer than broad between humerals, base produced forwards, oblique stripe each side from middle lateral margins half way to dorsal line the upper ends united to a transverse strongly curved line, yellow; head black, two oblique yellow lines, basal tubercle shorter than broad, marginate; corium with two discoidal cells, basal half costa broad .... *sodalis*

List of Species

corniculata Stal, Bid. Memb. Kan., p. 232, (1869). [Cayenne, Dutch Guiana].

sodalis Goding, Bul. Brook. Ent. Soc., XXIII, p. 140, (1928). [Napo River, Ecuador].

Cicada rhombea Fabricius (Spec. Ins., II, p. 316) has sometimes been listed as a membracid. Stal who examined the type placed it in the Tettigoniellid genus *Choriphyllum* Serville. It is from South America.

Hemiptycha quadrata was not described by Fairmaire, but was figured on plate 6, figure 23. Habitat unknown.

Laporte (An. Soc. Ent. Fr., I, p. 227, pl. 6, fig. 7) described *Acanthicus desmarestii* as a new species from Brazil, adding *Cigale spinosa* Stoll (Cig., p. 64, pl. 16, fig. 85) to the genus from Surinam. The first is a pupa of some species of Lycoderes, the second a larva of some unknown membracid.

Since the publication of this series the following new species have been described:

Scytodepsa tricarinata Funkhouser, Jour. N. Y. Ent. Soc., XXXV, p. 163, pl. 17, fig. 7. Habitat: Rio Pachitea, Peru. (Subfamily Aethalioninae).

Orthobelus wolcotti Goding, Jour. N. Y. Ent. Soc., XXXVI, p. 37. Habitat: Mt. Puilsboreau, Haiti; West Indies. (Subfamily Centrotinae).

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EXPLANATION OF PLATES

PLATE X

Fig. 1. *Heranice miltoglypta* Fairmaire: *a* side view; *b* tegmen. (Williams del.)

Fig. 2. *Darnoides brunneus* Germar. (F. X. Williams del.[4])

Fig. 3. *Maturna parvula* Fabricius: *a* side view; *b* tegmen. (Williams del.)

Fig. 4. *Polyglyptodes cornigerus* Stal: *a* side view; *b* tegmen. (Williams del.)

Fig. 5. *Omolon tridens* Walker

Fig. 6. *Paragargara tholoidea* Goding: *a* side view; *b* tegmen.

PLATE XI

Fig. 7. *Rhexia biplaga* Walker: *a* side view; *b* dorsal view; *c* tegmen. (China del.)

Fig. 8. *Rhexia flavicans* Fairmaire, (*Hemiptycha cumulata* Walker): *a* side view; *b* dorsal view. (China del.)

Fig. 9. *Maturna ephippigera* Fairmaire, (*Oxygonia lineosa* Walker): *a* side view; *b* dorsal view; *c* front view. (China del.)

ADDENDA

The following references were inadvertently omitted from their proper places.

Page 204. Under *crassicornis* add:

cameroni Griffini, Bol. Zool. Anat. Comp., x, p. 3, (1895). [Brazil].

Page 261. Under *vitulus* add:

pallens Germar, Mag. Ent., IV, p. 25, (1821). [Brazil].

spinifera Fairmaire, Rev. Memb., p. 284, (1846). [Brazil].

curvilinea Walker, List Hom. Brit. Mus. Suppl., p. 132, (1858). [Rio Negro, Brazil; Venezuela].

rufescens Butler, Cist. Ent., II, p. 218, (1877). [Brazil].

distans Butler, Cist. Ent., II, p. 218, (1877). [Brazil].

minor Fowler, Biol. Cen.-Am., Hom., II, p. 103, (1894). Buckton, Mon. Memb., p. 171, pl. 35, fig. 6, (1903). [Mexico; Central America].

intermedia Fowler, Biol. Cen.-Am., Hom., II, p. 105, (1894). [Bugaba, Chiriqui, Panama].

concinna Fowler, Biol. Cen.-Am., Hom., II, p. 106, pl. 7, fig. 15, (1894). [Mexico; Callanga, Peru; Bartica, British Guiana].

cornuta Fowler, Biol. Cen.-Am., Hom., II, p. 110, (1894). [Bugaba, Panama].

dubia Buckton, Mon. Memb., p. 171, pl. 35, fig. 7, (1903). [Mexico; Central America].

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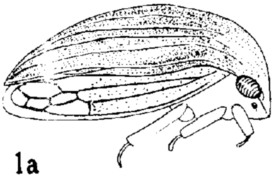
[4] Mr. China's figures were drawn from Walker's types. Dr. Williams' figures were drawn from material in my collection.



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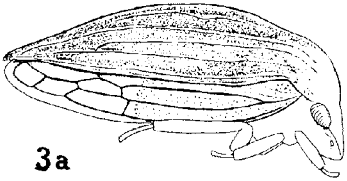

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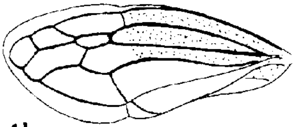

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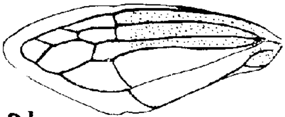

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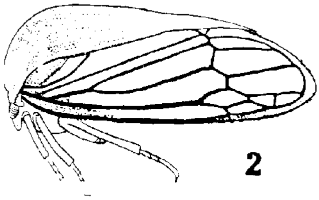

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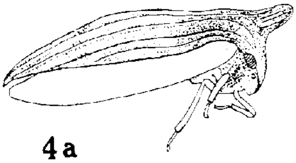

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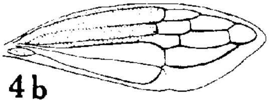

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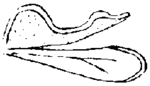

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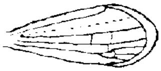
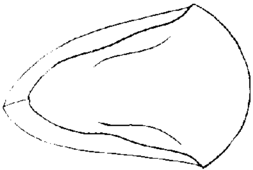


6b

GODING: SOUTH AMERICAN MEMBRACIDAE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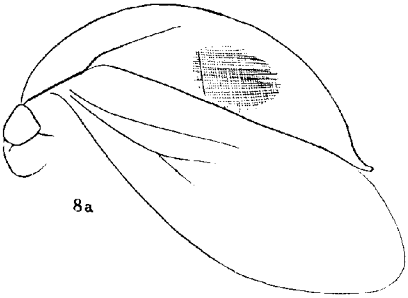
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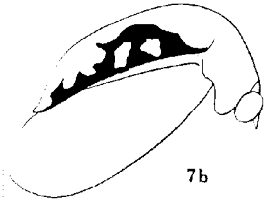
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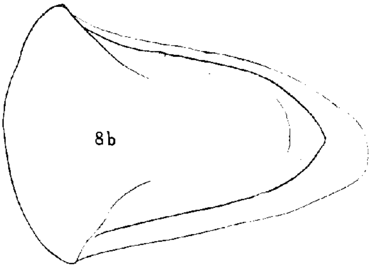
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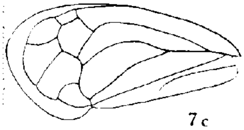
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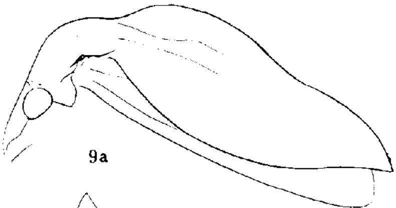
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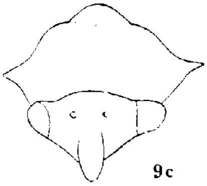
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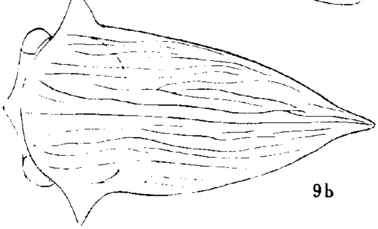
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GODING—SOUTH AMERICAN MEMBRACIDAE

THE LATER LARVAL STAGES OF PANTALA
(ODONATA: LIBELLULIDAE)

BY LAURA LAMB

University of Pennsylvania, Philadelphia, Pa.

A previous paper, "A Tabular Account of the Differences Between the Earlier Stages of Pantala Flavescens", published in these Transactions[1] was incomplete in the description of the final instars. This was due to the loss of the single individual which had been reared to the eleventh instar. The notes on the final instar were from exuviae collected at Primos, Delaware County, Pennsylvania, Sept. 9, 1915. This incompleteness is the reason for the present paper.

The material for this paper was collected and reared by Dr. Philip P. Calvert, under whose direction the former paper was written and to whom the writer is greatly indebted for help and guidance in the present instance.

The material consisted of five larvae of Pantala flavescens, collected at Primos, August 11, 1926, but only two of them yielded penult and ultimate exuviae as well as imagos, viz., number one, moulted Steptember 4 to 5, and transformed October 7; number five, moulted September 1 to 4 and transformed on October 4. Number four transformed on September 13; number three died on September 28 at the beginning of transformation; these two were therefore in the last larval instar when collected. Number two died on August 24th in attempted moulting, but had not completed its larval period. The penult exuviae were preserved in alcohol, the ultimate exuviae were of course dry and have so remained.

The differences between the tenth instar and the penult are as follows (the number before each character is that used to denote it in the 1925 paper):

Tenth Instar (1925 paper)	*Penult (1926 material)*
9. 14 or 15 mental setae	16 or 17 mental setae
10. 11 or 12 lateral setae	13 lateral setae

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[1] Vol. L, pages 289-312 (No. 861) issued Jan. 12, 1925.

Tenth Instar (1925 paper)	*Penult (1926 material)*
12. Width of head 3.84 mm.	Width of head 4.515-4.945 mm.
13. Length of head 2.40 mm.	Length of head 3.612 - 3.268 mm.
14. The second pair of wing cases extends to the fourth abdominal segment, the first pair extends over the third segment.	The second pair of wing cases extends over the fourth abdominal segment, the first to the fourth or over the third.
19 to 21. Length of joints of first pair of legs, femur—2.324 mm., tibia — 2.856 mm., tarsus—1.596.	Length of joints of the first pair of legs, femur—3.225 mm., tibia — 3.569 mm., tarsus—1.80 to 2.21 mm.[2]
22 to 24. Length of joints of second pair of legs; femur — 2.94 mm., tibia — 3.08 mm., tarsus—1.512 mm.	Length of joints of second pair of legs; femur—4.3 and 4.3 mm., tibia—4.3 mm., tarsus—2.04 to 2.29 mm.
25 to 27. Length of joints of third pair of legs; femur —3.976 mm., tibia—3.64 mm., tarsus—1.624 mm.	Length of joints of the third pair of legs; femur—6.02 and 6.25 mm., tibia — 5.289 mm. and 4.73 mm., tarsus—1.96 to 2.45 mm.
30. Length of thorax 2.688 mm.	Length of thorax 4.429 mm. and 3.546 mm.
31. Width of thorax 3.12 mm.	Width of thorax 5.418 mm. and 4.73 mm.
40. Width of abdomen 5.232 mm.	Width of abdomen 6.75 mm. and 5.805 mm.
41. Length of abdomen 8.976 mm.	Length of abdomen 10.707 mm. and 9.93 mm.
42. Total length 14.044 mm.	Total length 18.748 and 16.738 mm.

These comparisons indicate that the penult exuviae of the new material are equal to the eleventh instar of the previous material. This makes twelve instars in all. Warren's[3] total was ten or twelve instars which were passed in an average of eighty days. The individual described in my former paper, passed ten instars and a part of the eleventh in ninety days. The final stage of the second material lasted from thirty to thirty-two days, which would be one-fourth the total life of the nymph. But the first material was observed from September 8, 1923, to December 8, 1923, when the temperature was lower and the food more scarce than from August 11th to October 7th, when the second lot were observed. This difference in time of year might make some still unexplained differences in the number of days.

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[2] The tarsal measurements do not include the claws.

[3] College of Hawaii Publications, Bull. no. 3, 1915.

In March, 1920, Professor Kennedy[4] described the larva of *Pantala hymenaea* as differing from the naiad of *Pantala flavescens* in that the movable hook of the lateral lobe of the labium was twice as long as the crenulations of the distal edge of the lobe while the measurements of the body indicated that the latter is more slender than the *flavescens* naiad.

Measurements were made of the movable hooks of eight ultimate exuviae of *flavescens*. These averaged 1.0836 mm., while the average measurement of the first crenulation nearest was .403 mm., hence the movable hook in *flavescens* averaged 2.6 times the first crenulation.[5] The measurements for one ultimate exuviae and two larvae of the last instar of *hymenaea* (Professor Kennedy's material, kindly lent by him) averaged .7611 mm. for the movable hook and .344 mm. for the first crenulation, hence the movable hook is 2.2 times the first crenulation. The measurements for *flavescens* vary, but do not seem to indicate that *hymenaea* is more slender. Other differences, which I have found and not noted by him are that *hymenaea* has seventeen to eighteen lateral labial setae while *flavescens* has but thirteen or fourteen. Also in the one specimen of *hymenaea* retaining antennae, the third and the sixth segments are subequal and the first is three-fourths the second. In *flavescens*, the second is twice the first and the third is longer than the sixth.

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[4] Canad. Ent. LV, pp. 36-37.

[5] In a letter from Mr. Nathan Banks to Dr. Calvert, dated Cambridge, Mass., 20 May, 1925, is this statement; "There are 2 exuviae here [Museum of Comparative Zoology] and head of another marked flavescens. From (one) an imago much shriveled, was bred by Scudder. The movable hook is fully 1 mm. long, and twice as long as first crenulation (which by the way on one is broad or divided)."

NOTES ON MALAYAN AND PHILIPPINE DERMAPTERA, WITH THE DESCRIPTION OF TWO NEW SPECIES

BY MORGAN HEBARD

In 1927 Dr. A. Borelli and the author were unfortunately both working on material of this order, a goodly portion of which had been collected at Fort de Kock, Sumatra, by E. Jacobson. The results were published by the former in Supplementa Entomologica, XV, pages 69 to 80, in March, and prior to the latter's paper which appeared in the Proceedings of the Academy of Natural Sciences, on April 7th.

In order to correct the resultant synonyms and record a few interesting specimens hitherto unstudied, the following notes are published. Two new species are described.

Unless otherwise noted the material is in the collection of the author at the Academy of Natural Sciences.

PYGIDICRANIDAE

DIPLATYINAE

Diplatys sublobatus Borelli

Patignian, Philippine Islands, March 18, (G. Boettcher), 1 ♀.

This specimen agrees with the female description, published in 1923. The female forceps have the straight, cingulate internal margin very finely serrulate. The forceps bear dorso-proximad an abrupt, rounded triangular elevation which is laterally flattened.

PYGIDICRANINAE

Kalocrania siamensis (Dohrn)

Kuala Tahan, Pahang, November 22, 1921, (F. N. Chasen), 1 ♂.

This species is closely allied to *K. pallidipennis* (Haan). It apparently is a heavier, darker insect, the forceps more angulate, symmetrical and decidedly specialized.

Kalocrania imperatrix (Burr)

Fort de Kock, Sumatra, February, 1922, (E. Jacobson), 1 ♂.

Pyge piepersi (Burr)

Patignian, Philippine Islands, March 18, (G. Boettcher), 1 ♀.

This specimen agrees with the female recorded from Baguio, Benguet, Luzon, Philippine Islands, by Borelli in 1916. It measures; length of body (not including forceps) 19.5, length of forceps 5.2 mm.

ECHINOSOMATINAE

Echinosoma sumatranum (Haan)

Kuala Tahan, Pahang, November 16, 1921, (F. N. Chasen), 1 ♀, [Raffles Mus.].

LABIDURIDAE

ALLOSTETHINAE

Allostethus indicum (Burmeister)

Semangko Pass, Selangor-Pahang, 2700 feet, March, 1912, 11 adults, 2 juv., [Raffles Mus.].

In the early stages the general coloration is very dark, the distal portions of the femora conspicuously buffy, the apices of the tibiae less strikingly buffy.

PSALINAE

Euborellia plebeja (Dohrn)

We believe our generic assignment of this species in 1927 to be correct and that *Psalis* (as given almost contemporaneously by Borelli for material also from Fort de Kock, Sumatra) is restricted to tropical America.

From additional material now at hand[1], however, we find that *Labidura femoralis* Dohrn represents a distinct species[2], as distinguished by Borelli in 1926. That species has also been referred to *Psalis*, but is the monotypic genotype of *Landex* Burr, a valid and distinct genus.

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[1] Calcutta, India, June 20 to 25, 1901, (Maindron), 1 ♀, (truncate tegmina, longer than broad; no wings), [Paris Mus.].

Yen Bay, Tonkin, 1908, (Lieut. Poirmeur), 1 ♀, (determined by Borelli as *femoralis*), (macropterous), [Paris Mus.].

Tuyen Quan, central Tonkin, 1901, (A. Weiss), 1 ♀, (determined by Burr as *femoralis*), (macropterous,, [Paris Mus.].

Upper Clapre River, Tonkin, 1908, (J. de Retz), 1 ♀, (macropterous), [Hebard Cln.].

[2] We suggested possible synonymy in 1927.

LABIIDAE

NESOGASTRINAE

Nesogaster amoenus Stål

Fort de Kock, Sumatra, May, 1921, (E. Jacobson), 1 ♂, (very small, macropterous).

Laut Tawar, Simalur Island, Sumatra, August, 1913, (E. Jacobson), 1 ♂, 1 ♀, (very small; tegmina quadrate, no wings showing).

The small pair are by no means colored in as sharp contrast as the specimens from the mainland of Sumatra before us. The lateral portions of the pronotum, moreover, are not dark but are as pale as the pale lateral portions of the tegmina.

LABIIDAE

SPONGIPHORINAE

Apovostox pygidiatus (Dubrony)

Semangko Pass, Selangor-Pahang, 2700 feet, March, 1912, 1 ♂.

In the "Fauna of British India" Burr has apparently correctly recorded this species from Burma and Java. His Hawaiian material represents, however, a very different insect, since described as *Labia dubronyi* by Hebard.

Apovostox semiflavus (Bormans)

Fort de Kock, Sumatra, January, 1922, (E. Jacobson), 1 ♀, (depauperate; forceps unusually short).

Our reasons for proposing *Apovostox*, and separating this species and *pygidiatus* (Dubrony) from *Spongovostox*, were given in 1927.

Chaetospania sumatrana Borelli

It is clear that our *C. dichroma* is a synonym of this species, the description of which appeared a month earlier.

LABIINAE

Labia karnyi Borelli

Our *L. abnormis*, 1927, is a synonym, described because at that time we had not yet received the paper in which *karnyi* was proposed[3].

Fort de Kock, Sumatra, February, 1922, (E. Jacobson), 1 ♂, (macropterous; with large eyes).

Prolabia arachidis (Yersin)

Fort de Kock, Sumatra, XI, 1920, (E. Jacobson), 1 ♂, 1 ♀.

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[3] Treubia, VIII, p. 263, (1926).

CHELISOCHIDAE

CHELISOCHINAE

Hamaxas fuscus (Borelli)

Our *H. nitidulus* is a synonym of this species, the description of which appeared a month earlier. For the reasons then given (1927), we refer *fuscus* to *Hamaxas*.

Fort de Kock, Sumatra, January, 1921, (E. Jacobson), 1 ♀.

Hamaxas versicolor Borelli

Limis, Philippine Islands, February, 1928, (G. Boettcher), 2 ♂, (dark; Borelli's Var. c.).

Saob Cotobato, Mindanao, Philippine Islands, April, 1913, (E. H. Taylor), 1 ♂, (Borelli's Var. b).

Proreus ritsemae (Bormans)

This species was recorded as *Chelisoches ritsemae* by Borelli in 1926. We are convinced that, if *Proreus* Burr is to be recognized as a valid genus, *ritsemae* must be referred to it, as we stated in 1927.

Proreus ludekingi (Dohrn)

Fort de Kock, Sumatra, December, 1921, (E. Jacobson), 2 ♂.

One of these specimens has normal, macrolabic forceps; the other is brachylabic.

Proreus coalescens (Borelli)

It is evident from the description of *Chelisoches coalescens* Borelli, 1927, that the species must also be referred to *Proreus*.

Proreus simulans (Stål)

Kuala Tahan, Pahang, November 7, 1921, (F. N. Chasen), 1 ♂, [Raffles Mus.].

Chelisoches morio (Fabricius)

Gilstead Road, Singapore, Straits Settlements, November, 1917, (V. Knight), 1 ♀.

Chelisoches bimammatus new species (Pl. XII, figs. 1 and 2)

This handsome species differs from *C. morio* (Fabricius) in the decidedly more longitudinal pronotum, shorter tegmina and wings, antennae not annulate but brown in all of distal portion, head, pronotum and tegmina showing a distinct though weak blue-green metallic luster and tarsi dark brown and consequently not in as strong contrast with the blackish limbs.

The pygidial features are particularly distinctive. In the male the small pygidium is strongly declivent and feebly projecting, its apex bimammate. In the female the pygidium is somewhat less declivent and so projects to a greater degree, its truncate apex very narrow and cuneiform.

Type.—♂ ; Batu Caves, Selangor. October 21, 1921. (F. N. Chasen.) [British Museum.]

Size much as in *morio*, form slightly more robust. Head decidedly more cordiform, caudal margin conspicuously concave mesad; cheeks shorter, so that they are only very slightly longer than the eye. Antennal joints shorter, the first about three (instead of four) times as long as broad, those after the third more distinctly pyriform; seventeen in all. Pronotum distinctly longer than broad, not including neck; lateral margins virtually parallel to the broadly convex caudal margin. Tegmina glabrous, but microscopically shallowly impresso-punctulate instead of smooth; about twice as long as dorsal width, caudal margins transverse, weakly convex toward sides and weakly concave toward sutural margins. Exposed apices of wings short. Abdomen glabrous dorsad with microscopic impressed punctulae slightly heavier but raised points at caudal margins weaker than in *morio*, ultimate tergite with four small nodes before the meso-caudal smooth area. Limbs very slightly shorter and heavier, but very similar to those of *morio*. Pygidium deflexed, terminating ventro-caudad in two conical projections—appearing bimammate. Forceps heavy, flattened, straight to incurved attingent apices; internal margin straight to a pre-median and post-median low stout tooth, concave between these proximad and there with a few minute tubercles.

This is the brachylabic condition. In a macrolabic paratype the longer forceps have a flange ending before end of proximal third in a sharper tooth and another tooth beyond beginning of apical third.

Allotype.—♀ ; same data as type. [British Museum.]

Smaller than male, very similar to this sex of *morio*. Agreeing with the above description except as follows. Ultimate tergite without nodes above meso-caudal smooth area. Pygidium with ventro-caudal apex narrowly truncate, the lateral angles slightly produced; very similar to that in this sex of *morio* but much narrower. Forceps weakly sigmoid, flattened distad, with no proximal flange, the ventro-internal margin irregularly armed with a few tubercles.

General coloration shining black; the head, pronotum and tegmina showing a very weak but appreciable metallic bluish sheen not found in *morio*. Antennae black proximad but rapidly becoming buckthorn brown. Tarsi dark brown.

The measurements of the macrolabic male follow those of the brachylabic type. Length of body ♂ 16.8 and 17, ♀ 15.3; length of pronotum (excluding neck) ♂ 2.69 and 2.84, ♀ 2.4; width of pronotum (cephalad) ♂ 2.27 and 2.48, ♀ 2.4; width of pronotum (caudad) ♂ 2.34 and 2.62, ♀ 2.22; length of tegmen ♂ 3.7 and 3.7, ♀ 3.4; length of forceps ♂ 5.2 and 8.2, ♀ 4.8 mm.

The allotype and two male paratypes bear the same data, one of the latter being distinctly more macrolabic than the others.

Chelisochella superba (Dohrn)

Gunong Kedang, Ipoh, Perak, 2 ♂, (one brachylabic, one macrolabic).

Length of body (not including forceps) 24.5 and 22.5, length of forceps 10.9 and 16.9 mm.

Adiathetus shelfordi Burr

Semangko Pass, Selangor, Pahang, 2700 feet, March, 1912, 1 ♂, (brachylabic), [Raffles Mus.].

Pontianak, Borneo, (from Oberthur), 2 ♂, (one macrolabic, one brachylabic).

The present material substantiates Shelford's assignment in 1911 of his *hercules* (based on a brachylabic male) as a synonym of his *shelfordi* (based on a macrolabic male[4]). Here is found not only astonishing diversity in the structure and armament of the forceps but of the penultimate tergite as well between brachylabic and macrolabic males of the same species.

FORFICULIDAE

ANECHURINAE

Allodahlia scabriuscula (Serville)

Maxwell's Hill, Perak, 3600 feet, April 10, 1904, 1 ♂, [Raffles Mus.].

OPISTHOCOSMIINAE

Opisthocosmia tenuis new species (Pl. XII, figs. 3 and 4)

Though of dull coloration this insect is one of the largest and most striking species of the subfamily.

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[4] Not a female as originally stated.

The male sex is readily recognized by the widely separated, lender and very elongate forceps, which are almost perfectly orizontal to the slightly reflexed apical portion and have their nternal margins finely denticulate, each armed with two small harp teeth in distal portion, directed ventro-distad.

Much the nearest relationship is shown to *O. longipes* (Haan), lescribed from Sumatra. That species apparently differs in aving the ultimate tergite armed and the forceps much heavier, shorter and much more heavily armed.

The greater size and enormously longer limbs and forceps give *tenuis* a very different appearance from the genotype, *O. centurio* Dohrn[5].

Type.—♂; Semangko Pass, Selangor-Pahang Boundary, Malay Peninsula. Elevation 2700 feet. March, 1912. [British Museum.]

Size very large, form normal, limbs and forceps extremely elongate for the Opisthocosmiinae. Head small, globose, with two irregular impressions between the antennal sockets, transverse suture and medio-longitudinal suture of occiput forming deep sulci and where they meet a decided depression, caudal margin of occiput transverse. Eyes as long as cheek. Antennae moderately hirsute, all joints (except the very short second) extremely elongate. Pronotum very small, decidedly longer than broad, lateral margins virtually parallel, caudal margin broadly convex; dorsal surface laterad deeply and rather broadly sulcate, a shallower and broader transverse sulcation meso-caudad, a medio-longitudinal very fine and weak sulcus which changes to a faint carina caudad. Tegmina and wings fully developed, the former very broad, pinched latero-cephalad toward shoulders but without trace of a carina. Abdomen not depressed, expanding to a penultimate tergite, second and third tergites with well developed glandular nodes. Ultimate tergite strongly transverse, declivent caudad with surface showing two adjacent low convexities mesad before a narrow submarginal impressed area, terminated on each side by a low evenly rounded node, unarmed. Pygidium vertical, generally triangular, the median portion of its surface forming a very large convexity. Forceps very slender and exceedingly elongate, moderately divergent proximad then to become very gradually convergent to the somewhat more incurved slender apices; distad triquetrous, very sharply and finely scabrous; generally microscopically dentate and with larger though minute teeth along ventro-internal margin, a small sharp spine beyond end of proximal two-thirds and another slightly smaller spine at base of the apical portion. Caudal metatarsus nearly one-third longer than third joint and thickly pilose ventrad, second joint little expanded.

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[5] Philippine material of that species is in the author's collection.

Allotype.—♀ ; same data as type. [British Museum.]

Agrees closely with male, differing only as follows. Glandular nodes of abdomen smaller. Ultimate tergite much less transverse, convex declivent with roughened raised areas above arms of forceps and impressed between. Pygidium vertical, longer than broad, median portion decidedly convex, lateral margins very broadly concave to the bluntly rounded latero-caudal angles, between which the distal margin is very broadly concave. Forceps very slender, almost straight, very gradually convergent distad; proximad with a meso-dorsal ridge which becomes weaker as it runs into the dorso-external margin; ventro-internal margin proximad suddenly produced as a weak coarse flange, with margin microscopically serrulate, which gradually subsides, this margin armed distad with heavier though minute teeth; arm in distal cross-section quadrate; teeth absent but apices aciculate and curved moderately inward.

General coloration blackish bone brown, occiput and femora paler (natal brown) in recessive, but as dark in intensive individuals. One of the more distal antennal joints (sixth or eighth) with a very broad annulus of cinnamon buff. Tegmina and apices of wings showing a chocolate shade in some lights, the latter flecked proximo-externally and at apices (suturad) with cinnamon buff.

The measurements of a paratypic male, bearing the same data, follow those of the type. Length of body ♂ 14.8 and 17, ♀ 15; greatest width of head ♂ 2.27 and 2.3, ♀ 2.27; length of pronotum (not including neck) ♂ 2.34 and 2.27, ♀ 2.24; greatest width of pronotum (mesad) ♂ 1.77 and 1.75, ♀ 1.78; length of tegmen ♂ 5.1 and 5.1, ♀ 5.1; exposed length of wing ♂ 1.7 and 1.84, ♀ 2; length of forceps ♂ 14.4 and 15, ♀ 8 mm.

Timomenus bicuspis (Stål)

Kedah Peak, Kedah, 3200 feet, December, 1915, 1 ♂.

This insect agrees with *Kosmetor* Burr in the few features which have been given to separate it from *Timomenus* Burr. It would seem probable that *Kosmetor* will be found to be a synonym.

The present specimen agrees closely with Stål's description except that the forceps have a ventro-internal tooth at the end of the proximal three-fifths which is slightly though distinctly longer than the preceding denticulations and is, in consequence, alone clearly visible to the naked eye.

Stål does not describe the coloration of the tegmina and wings, which in the specimen before us are dull blackish, with median portion of tegmina except proximad and their sutural margins very dull deep bay, showing very weak contrast.

The two stout conical projections meso-caudad on the penultimate tergite are directed dorso-caudad and are preceded by a broad and strong depression. The pygidium is vertical, as deep as broad, its surface weakly convex but showing a trace of medio-longitudinal impression.

Timomenus aesculapius (Burr)

Fort de Kock, Sumatra, May and November, 1921, (E. Jacobson), 1 ♂, 1 ♀.

Cordax forcipatus (Haan)

Semangko Pass, Selangor-Pahang, 2700 feet, March, 1912, 1 ♂.

This specimen agrees closely with Haan's figure.

Eparchus tenellus (Haan)

Fort de Kock, Sumatra, January and September, 1921 and 1922, (E. Jacobson), 1 ♂, 2 ♀.

The tegmina are solidly dark in the male, vaguely buffy toward the shoulders in the two females.

EXPLANATION OF PLATE

PLATE XII

Fig. 1. *Chelisoches bimammatus* new species. Dorsal view of male ultimate tergite and forceps. *Type.* Batu Caves, Selangor. (X 8)

Fig. 2. *Chelisoches bimammatus* new species. Dorsal view of female ultimate tergite and forceps. *Allotype.* Batu Caves, Selangor. (X 8)

Fig. 3. *Opisthocosmia tenuis* new species. Dorsal view of male. *Type.* Semangko Pass, Selangor-Pahang Boundary. (X 3)

Fig. 4. *Opisthocosmia tenuis* new species. Dorsal view of female ultimate tergite and forceps. *Allotype.* Semangko Pass, Selangor-Pahang Boundary. (X 3)

PREVIOUSLY UNREPORTED TROPICAL AMERICAN BLATTIDAE (ORTHOPTERA) IN THE BRITISH MUSEUM

BY MORGAN HEBARD

Recently Mr. B. Uvarov of the British Museum asked that the hitherto undetermined American Blattidae, belonging to that institution be studied. The few specimens from temperate North America and material bearing data insufficient to be of any scientific value have been omitted in the present report.

The series recorded is not large, 238 specimens being reported, representing thirty-one genera and seventy-seven species, of which two genera and twelve species are new. Material not belonging to the British Museum has been included in the case of all new species and where such gave added value to the comments already made on a species. The new species come from the following countries; Lesser Antilles one, Bonaire Island (off the north coast of Venezuela) one, Tobago Island (north on the eastern coast of Colombia) one, Panama and Colombia one, Colombia two, British Guiana three, Amazonia one, southern Brazil two. Moreover such little known species are represented as *Pseudomops brunneri*, *Lamproblatta zamorensis*, *Epilampra testacea*, *Phoraspis flavipes*, *Tribonidium transversa* and *Parasphaeria ovata*.

PSEUDOMOPINAE

Dendroblatta sobrina Rehn

Gorgona Island, Colombia, VII, 1924, (Miss Cheesman), 1 juv. ♂.

This specimen is identical with immature males before us from Panama.

Eudromiella inexpectata (Rehn)

Kartabo, British Guiana, (M. D. Haviland), 1 ♂.

Demerara, British Guiana. 1 ♂.

Eudromiella bicolorata Hebard

Colon, Panama, VI, 10, 1924, (Miss Cheesman), 1 ♂.

Latiblattella angustifrons Hebard

Taboga Island, Panama, IX, 24, 1924, (Miss Cheesman), 1 ♀.

This, the first known female of the species, agrees closely with the male paratype from the same locality except in characters of sexual difference. The interocular space is wider, nearly two-thirds as wide as that between the antennal sockets, as would be expected in this sex and the organs of flight are shorter (length of body 9.8, length of tegmen 9.7 mm.). The pronotum is smaller and not as broad as the female of the related *L. inornata* Hebard.

Cariblatta reticulosa (Walker)

Jamaica, British West Indies, (attracted to light), 1 ♀.

Cariblatta tobagensis new species (Pl. XIII, figs. 1 and 2.)

This species belongs to the Delicatula Group[1] and is very similar in general appearance to *C. acdiculata* Hebard and *C. fossicauda* Hebard, in size being very slightly larger and the markings apparently less pronounced. The male subgenital plate is distinctive, simple laterad and without median production, but there supplied with two small rounded adjacent styles which have their dorsal surfaces heavily clothed with minute spines.

Type.—Scarborough, Tobago Island. June 1, 1914. (W. E. Broadway.) [British Museum.]

Size large for the Group which includes small species; form normal for the genus. Interocular space wide, fully equal occipital ocular depth. Palpi missing. Tegmina with numerous cross-veinlets between the (six) discoidal sectors distinct, darkened. Supra-anal plate small, transverse, weakly produced, with lateral margins weakly convex and with a very weak median emargination. Subgenital plate briefly produced outside the bases of the cerci, lateral margins straight and then convergent and broadly concave to the apex, where the margin shows two small but deep adjacent concavities which are filled by the styles, the surface of the plate there medio-longitudinally broadly angulate-sulcate and disto-laterad shallowly concave inside and along the margins. Styles minute irregularly rounded attingent lobes, no longer than wide, their dorsal surfaces thickly armed with minute chitinous spines. Cephalic femora with two and one distal spines on each ventro-caudal margin.

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[1] See Rehn and Hebard, Bull Amer. Mus. Nat. Hist., LIV, p. 15, (1927).

Allotype.— ♀ ; same data as type except taken June 19, 1914. [British Museum.]

Damaged; head and pronotum missing. Very similar to type but slightly larger. Tegmina very slightly more ample than in male. Supra-anal plate small, transverse, weakly produced; lateral margins straight but becoming weakly convex distad toward a weak median emargination. Subgenital plate more produced with lateral margins straighter laterad than in male, the margins thence very broadly convex, no median production being indicated.

Length of body ♂ 10.3, ♀ (estimated) 11.5; length of pronotum ♂ 2.1; width of pronotum ♂ 3.2; length of tegmen ♂ 9.7, ♀ 10.1; width of tegmen ♂ 3, ♀ 3.1 mm.

General coloration testaceous. Head light brownish buff with a broad band of bister between the eyes and traces of three other narrower bands indicated by flecks of bister on face, that between the ocellar spots strongest. Pronotal disk warm buff with paired lines and flecks of weak dresden brown and a few symmetrically placed dots of bister, of which the four mesocaudad are distinct. Lateral portions of pronotum and tegmina transparent, tinged with testaceous, immaculate except crossveinlets tinged with dresden brown in distal portions of the latter. Ventral surface of male abdomen buffy, with a fleck of bister and weak suffusions of dresden brown laterad on the proximal sternites; female with this area suffused with brown, this becoming heaviest on subgenital plate except along its free margin. Limbs buffy, with very small flecks of brown at bases of dorsal tibial spines in male, such flecking not present in female.

Cariblatta spinicauda new species (Pl. XIII, figs. 3 and 4.)

1892. *Phyllodromia delicatula* Brunner (not of Guerin, 1857), Proc. Zool. Soc. London, 1892, p. 202. [Chateaubelais and both windward and leeward sides of St. Vincent.]

1893. *Phyllodromia delicatula* Brunner (not of Guerin, 1857), Proc. Zool. Soc. London, 1893, p. 602. [Balthazar, Grenada.]

This species is also a member of the Delicatula Group and agrees closely with *C. aedieulata* Hebard in size and markings. The male genitalia are also generally similar but the subgenital plate bears no specialized lateral appendages and the minute similar styles are aciculate and decurved instead of being straight slender fingers.

The male subgenital plate is of similar type to that of *Neoblattella fraterculа* Hebard. In that larger insect, however, both the lateral and caudal portions of the plate are reflexed, the styles are as slender but straight and decidedly shorter with rounded apices not reaching as far as the more narrowly triangular productions of the reflected caudal portion of the plate, the margin of that portion between their apices much more deeply concave.

Type.—♂; St. Vincent, (Windward side,) British West Indies. (H. H. Smith.) [British Museum.]

Size and form normal for this Group of small species. Interocular space moderately wide, about three-quarters occipital ocular depth. Tegmina with cross-veinlets between the (six) discoidal sectors inconspicuous, there with a number of nodes which, however, are colorless and inconspicuous. Supra-anal plate small, transverse, weakly convex, with lateral margins converging to the very broadly convex apex. Subgenital plate symmetrical; margins convex convergent laterad then with a large deep concave emargination, beyond which the produced median portion of the plate is transverse with about thirty-five degree latero-caudal angles, its free margin very broadly concave (or in the paratype showing angulation so that it is transverse and straight between the bases of the lateral angles). In the two deep emarginations are situated the styles, similar slender fang-like processes, directed dorso-caudad and curving caudad, their apices projecting well beyond those of the latero-caudal angles of the median portion of the plate. Cephalic femora with two and one distal spines on each ventro-caudal margin.

Allotype.—♀; St. Vincent, British West Indies. (H. H. Smith.) [British Museum.]

Very similar to male. Interocular space slightly wider than ocular occipital depth. Supra-anal plate small, moderately produced, with apex showing a large concave emargination, the extremities of the plate on each side rounded. Subgenital plate large, scoop-shaped, free margin laterad decidedly convex, then concave but not as strongly so at base of cercus, then convex to an equal degree to the produced apex.

Measurements (in millimeters)

	Length of body	Length of pronotum	Width of pronotum	Length of tegmen	Width of tegmen
♂					
St. Vincent. *Type*	8.7	2	3.1	9.8	2.8
St. Vincent. *Paratype*	9	2.2	3.2	9.7	2.9
Balthazar, Grenada.	7.7[2]	1.9	2.8	8.8	2.7
♀					
St. Vincent. *Allotype*	8.7	2.3	3.3	9.2	2.9

General coloration testaceous. Head light brownish buff with a broad band of bister between the eyes and three other narrower bands of bister on face, that between the antennal sockets strongest. In the type (moderately recessive) the narrow band between the ocellar spots is indicated only by lateral suffused flecks and that above the clypeus by a series of such. In the other pair from St. Vincent not only are all the bands solid but the occiput is darkened. The pronotal markings are as here described for *C. tobagensis* in the type, more distinct in the Grenada male (moderately intensive) but less distinct in the St. Vincent pair (though these are otherwise of intensive coloration). Ventral surface of abdomen as in *tobagensis* and having in addition an extensive meso-proximal suffusion of brown in the males. Female subgenital plate almost wholly suffused with brown.

Specimens Examined.—4; 3 males. 1 female.

Windward side of St. Vincent, British West Indies, (H. H. Smith), 1♂, *type*.

St. Vincent, British West Indies, (H. H. Smith), 1♂, 1♀, *paratype, allotype*.

Balthazar, windward side of Grenada, British West Indies, (H. H. Smith), 1♂.

Cariblatta punctipennis Hebard (Pl. XIII, fig. 5.)

St. Christopher, British West Indies, 1912, (J. J. Quelch), 2♂, 1♀.

Barbados, British West Indies, 1902, 2♂.

The previously unknown male of this striking species shows an unusual, asymmetrical type of subgenital plate. The figured specimen is here indicated as allotype, coming as does the type, in the Academy of Natural Sciences, from Barbados.

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[2] Abdomen retracted.

LOPHOBLATTA new genus

This genus is erected to include *Blatta pellucida* Burmeister, here designated as genotype, described from Para, Brazil, and *arawaka* here described. Material of a third undescribed South American species is before us.

Lophoblatta is closely related to *Neoblattella* Shelford (to which genus *pellucida* has of recent years been assigned), differing principally in the proportionately more ample and more evenly convex pronotum and male abdomen with seventh tergite specialized. The general form suggests *Latiblattella* Hebard, but many features show it to be derived from very different stock.

This genus may be further diagnosed as follows. Cephalic femora with ventro-cephalic margin armed with a row of spines which gradually decrease in size distad, several before the three[3] longer terminal spines being piliform; ventro-caudal margin armed with four and one distal elongate spines. Tegmina with discoidal sectors longitudinal. Wings with costal veins not thickened distad, discoidal vein with numerous complete branches, intercalated triangle small. Organs of flight fully developed in both sexes, but never strongly caudate. Size averaging decidedly larger and form much broader than in *Cariblatta* Hebard, much as in the Fraterna Group of *Neoblattella*. Tarsal claws symmetrical, decidedly lamellate, the margins of the flange serrulate. Pulvilli large and acutely produced. Arolia large.

Lophoblatta arawaka new species (Pl. XIII, figs. 6 and 7.)

This broad, uniformly very light tawny buff insect is closely related to *L. pellucida* (Burmeister), a species which is now known from French Guiana and the States of Para and Parahyba, Brazil, (Pl. XIII, fig. 8).

That insect differs only in the slightly narrower interocular space (due mainly to the narrower head), less ample pronotum and male subgenital plate with pair of produced areas more decided, forming between them a deep median concavity. In size it averages as large as the Venezuelan and British Guianan series of *arawaka*, which are smaller than the Trinidad specimens.

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[3] See discussion here under *Amazonina* new genus.

Type.—♂; Caparo, Trinidad. August, 1913. (S. M. Klages.) [Hebard Collection, Type no. 1144.]

Size medium, form very broad for Group Neoblattellae. Interocular space broad, four-fifths width between antennal sockets. Ocellar spots moderately large (but distinct only in well preserved specimens). Maxillary palpi with fourth joint four-fifths as long as third and fifth three-quarters as long as fourth. Pronotum ample, weak convexity continued to lateral margins, point of greatest width meso-caudad. Tegmina and wings fully developed but not reaching cercal apices; the former with (seven or eight) longitudinal discoidal sectors, some of which fork distad, the latter with costal veins not clubbed distad. Dorsal surface of abdomen not specialized laterad and latero-caudal angles rounded and not produced; seventh tergite narrowly visible, furnished with a round tuft of agglutinated hairs mesad. Supra-anal plate of delicate structure, triangularly produced between cerci with apex rounded, length half basal width. Subgenital plate transverse, symmetrical, free margin with a sudden small concave emargination beneath cercal bases, thence straight and weakly oblique rounding into the broad and weakly concave median portion, the two rounded projections thus formed thickened so that their ventral surfaces are convex. Styles situated in the lateral emarginations, similar, simple, cylindrical, straight and weakly tapering to rounded apices, each nearly four times as long as proximal width.

Allotype.—♀; same data as type. [Hebard Collection.]

Very similar to male, slightly larger, distinctly broader. Dorsal surface of abdomen unspecialized. Supra-anal plate little produced, lateral margins very broadly concave and weakly oblique to a small but deep median U-emargination, the lateral apices thus formed well rounded. Subgenital plate simple, very ample, little produced, free margin between cerci generally very broadly convex but with very weak concavity indicated for a short distance on each side and broadly mesad.

Measurements (in millimeters)

	Length of body	Length of pronotum	Width of pronotum	Length of tegmen	*Width of tegmen*
♂					
Caparo, Trinidad. *Type*	14.7	3.9	5	12.8	4.3
Caparo, Trinidad. *Paratypes* (27)	14.7-15.3	3.8-3.9	5-5.2	13-13.4	4.3-4.7
Cariaquito, Venezuela.	12	3.7	4.8	11.5	4.2
Kartabo, British Guiana. (2)	11.8-12.5	3.7-3.7	4.8-4.9	11-11.5	3.7-3.8
♀					
Caparo, Trinidad. *Allotype* ..	13.7	4.1	5.8	13.7	4.9
Caparo, Trinidad. *Paratypes* (14)	12.8-13.7	3.8-4.3	5-5.8	12.6-14.7	4.3-4.8
Cariaquito, Venezuela.	11	3.9	5.4	11.8	4
Kartabo, British Guiana. (4)	11-11.8	3.8-4	4.9-5.2	11.8-11.9	4.2-4.2
Ongelijk, Surinam.	12.2	3.9	5	12.1	4.2

In specimens of *pellucida* from French Guiana and Para the pronotal width is in one male 4.2, in twelve females 4.4 to 4.7 mm.

General appearance translucent buffy tinged with ochraceous-tawny. Head ochraceous-buff with a faint tawny tinge, showing the following faintly darker markings; a moderately broad interocular band, a narrow interocellar band, the eyes and ocelli in this area faintly margined with a darker suffusion, a fleck on each side near antennal socket, a smaller fleck just below and nearer antennal socket and an equidistant larger pair on face. Pronotum with disk and immediate margin light ochraceous-tawny, two minute flecks of brown usually present caudad on disk, rarely a few even less conspicuous flecks meso-laterad. Other portions of pronotum and lateral portions of tegmina transparent very faintly tinged with testaceous, other portions of tegmina very faintly and evenly tinged with ochraceous-tawny. Limbs and ventral surface ochraceous-buff with a very faint tawny tinge. Male with ventral surface of abdomen with a medio-longitudinal line of blackish brown which narrows to disappear at caudal margin of sixth sternite; female with entire median portion blackish brown, this forming a large and conspicuous shield-shaped marking on subgenital plate, which is indented on each side cephalad and almost reaches the caudal margin of the plate. Limbs immaculate or with very small flecks of brown at spine bases.

Specimens Examined.—62; 34 males and 28 females.

River Estate, Diego Martin, Trinidad, (R. A. Wood), 1♂, 1♀, *paratypes*, [Hebard Cln.].

Port of Spain, Trinidad, (H. Caracciola), 1♀, *paratype*.

St. Augustin, Trinidad, III, 25, 1916, (R. A. Wood), 2♀, *paratypes*, [Hebard Cln.].

Caparo, Trinidad, VI to VIII, 1913, (S. M. Klages), 28♂, 15♀, *type*, *allotype*, *paratypes*, [Acad. Nat. Sci. Phila. and Hebard Cln.].

Trinidad, (H. D. Chipman), 1♂, 4♀, *paratypes*, (recorded by Bruner as *Phyllodromia adspersicollis*), [Hebard Cln.].

Cariaquito, Venezuela, I, 1911, (Stewardson Brown), 1♂, 1♀, [Acad. Nat. Sci. Phila.].

Kartabo, British Guiana, X, 1922, (M. D. Haviland), 1♂; (William Beebe), 2♂, 3♀, [Acad. Nat. Sci. Phila.].

Ongelijk, Para River, Surinam, V, 2, 1927, (J. C. Bradley), 1♀, [Cornell Univ.].

AMAZONINA new genus

We erect this genus to include two South American species, *Phyllodromia conspersa* Brunner (later generically assigned to *Neoblattella*) which we designate as genotype, and *Neoblattella platystylata* Hebard. Material of a third, undescribed, Amazonian species is before us.

These species are small and comparatively slender, with fully caudate organs of flight, in these features agreeing with the species of the Impar Group of *Neoblattella*. They may be distinguished by two (three in the Adspersicollis Group of *Neoblattella*,[4] to which the genotype belongs) elongate distal spines on the ventro-cephalic margin of the cephalic femora, small dark nodes scattered over the tegmina[5] and the female subgenital plate armed with minute short but stout and strongly chitinous spines on its free margin meso-laterad.

The presence of three instead of two elongate distal spines on the ventro-cephalic margin of the cephalic femora easily distinguishes the species of the Adspersicollis, Nahua and Fraterna Groups of *Neoblattella* from those of *Amazonina*. In *Cariblatta* and the Impar Group of *Neoblattella* two elongate distal spines are present, preceded by a minute spine, very little if in some cases at all longer or heavier than those preceding it. In those species the present character is of little or no value, though, if it be used, they appear to belong rather to the "two" than to the "three" category, but certainly not as plainly as does *Amazonina*.

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[4] We incorrectly gave two such spines for *Neoblattella* in our 1919 key—Mem. Amer. Ent. Soc., No. 4, p. 28.

[5] This is found in all of the species of *Amazonina*, but also is present in *Cariblatta punctipennis* Hebard and *Neoblattella nodipennis* Hebard, and may therefore have little or no value for generic diagnostic purposes.

The genus *Neoblattella* is so large and has included so many diverse types that we have previously separated and erected new genera only for the more easily separable series of species (such as *Cariblatta* and *Lophometopum* and Rehn and Hebard's *Cariblattoides* and *Nymphodromia*). Study of the South American forms now convinces us that the species which we had referred to the Pellucida Group must be generically separated (here placed in the new genus *Lophoblatta*) as well as the present forms hitherto referred to the Conspersa Group.

Should *Neoblattella* be restricted to the species now placed in the Adspersicollis Group, we would have the forms of the Nahua Group perilously close for generic separation, and in turn those of the Fraterna Group, showing on the one hand affinity to the Nahua Group, but on the other a decidedly stronger, but mainly superficial, resemblance to the species of *Lophoblatta*.

Finally it is evident that *Amazonina* is closer to other groups still assigned to *Neoblattella*, but which we believe will eventually be recognized as generically distinct.

The genus *Amazonina* shows the following characters. Cephalic femora with ventro-cephalic margin armed with a row of spines which gradually decrease in size distad, several before the two longer terminal spines being very small or piliform; ventro-caudal margin armed with three (rarely four) and one distal spines. Tegmina with minute but distinct darkened nodes distad; discoidal sectors longitudinal. Wings with costal veins strongly clubbed distad; discoidal vein with (usually three) complete branches; intercalated triangle of moderate size. Organs of flight fully developed in both sexes, caudate. Size somewhat larger, form much as in *Cariblatta*, thus agreeing with the species of the Impar Group of *Neoblattella*. Dorsal surface of male abdomen unspecialized. Tarsal claws symmetrical, lamellate, the margins of the flange decidedly serrulate. Pulvilli large, the more distal slenderly produced. Arolia large.

Amazonina platystylata (Hebard)

Kartabo, British Guiana, VI to X, 1922, (M. D. Haviland), 2♂, 4♀.

Villa Ana, Ferrocarril de Santa Fé, Argentina, I, 1926, (K. J. Hayward), 1♂.

The Argentinian specimen is small (length of tegmen 9.1 mm.) with tegminal dots and facial markings very dark brown, the pale interocellar band, however, wide and cream color. Considerable size variation is shown by large series before us and we believe that this individual is merely a depauperate and unusually intensively colored specimen.

The species was previously known from British Guiana to the confluence of the Rio Branco and Rio Negro.

Neoblattella fratercula Hebard

This species belongs to one of the Groups far removed from that of the genotype, *adspersicollis.*

Gorgona Island, Colombia, VII, 1924, (Miss Cheesman), 1 juv. ♀.

This specimen agrees closely with an immature male in the same instar from Panama in the author's collection.

Neoblattella laodamia Rehn and Hebard

This species belongs to the Nahua Group.

Windward side of St. Vincent, British West Indies, (H. H. Smith), 1♀, determined as *Phyllodromia adspersicollis* by Brunner.

This female was taken with the type and is here designated the allotype. It agrees closely with the male, the pronotum being a little more ample and the organs of flight very slightly shorter. The interocular space is wider, almost three-fifths the width between the antennal sockets. The supra-anal plate has the lateral margins concave convergent, distad it is produced in two fingers with a deep and very narrow U-shaped emargination separating these. The subgenital plate is simple with free margin convex laterad then less strongly convex in median portion. Length of body 17, length of pronotum 4.8, greatest width of pronotum 6.3, length of tegmen 17.8, greatest width of tegmen 5.8 mm.

Neoblattella guianae new species (Pl. XIII, fig. 9.)

This species, a member of the Adspersicollis Group, is nearest *N. longior* Hebard. In size it is larger, agreeing better in this respect with *N. poecilops* Hebard. Its markings are very weak, of the same general type but decidedly weaker than in *longior*, even weaker than in *N. binodosa* Hebard[6].

Type.— ♂ ; Kartabo, British Guiana. July 13, 1922. (William Beebe.) [Acad. Nat. Sci. Phila., Type no. 5478.]

Size large and form broad. Interocular space narrow for the Group, two-fifths width between antennal sockets and about one-half vertical depth of dorsal portion of eye[7]. Ocellar spots distinct (but obsolete in poorly preserved material). Palpi with fourth joint four-fifths as long as third, fifth three-quarters as long as fourth. Pronotum with greatest width slightly caudad of median line. Tegmina and wings fully developed, the former with (fourteen) longitudinal discoidal sectors, the latter with costal veins not clubbed or thickened distad. Dorsal surface of abdomen with narrowly visible seventh tergite decidedly and rather broadly angulate-emarginate mesad, the caudal margin of the preceding tergite showing similar angulate-emargination and that of the eighth a tendency toward bilobation. Supra-anal plate with lateral margins between cerci straight and convergent, then rounding to a minute median emargination, giving a sub-bilobate appearance. Subgenital plate with lateral portions reflexed, their free margins convex down to the similar, socketed, straight, simple styles which are nearly four times as long as wide proximad; median marginal portion almost transverse, very weakly convex[8].

Allotype.— ♀ ; St. Jean du Maroni, French Guiana. [Hebard Collection.]

Agrees closely with the type except as follows. Size slightly larger, pronotum distinctly larger. Interocular space slightly over half width between antennal sockets. Supra-anal plate U-emarginate distad, the lateral projecting portions triangular with apices sharply rounded. Subgenital plate simple, the lateral margins rather strongly convex, then very broadly and feebly concave, median portion weakly produced and rather broadly convex.

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[6] The species with which *guianae* is compared were all described from French Guiana in 1926.

[7] In *poecilops* three-fifths that dimension only when measured with head in direct cephalic aspect, two-fifths that actual dimension measured with head in dorso-cephalic aspect.

[8] In the paratype the extruded genitalia show a sort of ventral apron, its distal margin convex, chitinous and armed with eleven, regularly placed, long, straight, chitinous spines all directed distad.

The measurements of the type are given first for the males, of the allotype last for the females. Length of body ♂ 15.2 and 17, ♀ 17 and 18; length of pronotum ♂ 4.2 and 4.3, ♀ 4.4 and 4.5; width of pronotum ♂ 5.7 and 5.9, ♀ 6 and 6.3; length of tegmen ♂ 17.8 and 19.7, ♀ 19.1 and 19.4; width of tegmen ♂ 5.6 and 5.9, ♀ 5.7 and 5.9 mm.

Generally light testaceous with a very weak tinge of ochraceous-tawny. Head ochraceous buff with a very faint tawny tinge, a broad interocular bar of light cinnamon brown and a narrower one between the ocellar spots, an area of opaque ochraceous-buff below the latter (but evident only in well preserved specimens). The allotype is more intenstively colored and has lateral suffusions of light cinnamon brown below this and a fleck ventrad on each side of the same. Pronotum with disk ochraceous-buff with a very weak tawny tinge, marked with minute brown flecks as follows; two caudad, three mesad on each side of the median line, one or two on the margins on each side caudad of median line, one on the margin meso-cephalad and a very small one on the margin cephalad on each side. Limbs buffy with flecks of brown at the bases of the spines (except on the ventro-cephalic margins of the cephalic femora). Abdomen of male ventrad buffy, with a medio-longitudinal line of dark brown which narrows caudad and is interrupted on the last sternites, each sternite washed with dark prouts brown laterad and with a large lateral dark fleck, the subgenital plate suffused distad with prouts brown. Female abdomen ventrad similarly colored but with dark median marking very broad proximad and heavily suffusing meso-distal portion of subgenital plate. Tegmina and wings immaculate.

Specimens Examined.—4; 2 males and 2 females.

Kartabo, British Guiana, VII, 13, 1922, (William Beebe), 1 ♂, *type*, [Acad. Nat. Sci. Phila.].

British Guiana, (A. W. Bartlett), 1 ♂.

St. Jean du Maroni, French Guiana, 2 ♀, *allotype*, [Hebard Cln.].

Neoblattella adspersicollis (Stål)

This species is of particular interest, as it is the genotype of *Neoblattella*.

Chapada, Brazil, 2600 feet, XI, 1902, (A. Robert), 1 ♂.

Compared with a topotypic female (Rio de Janeiro)[9] this specimen agrees closely except in features which are apparently sexual. The interocular space though narrower, as would be expected in a male, is over three-fifths the width between the antennal sockets. The head and pronotal markings are homologous, but even less conspicuous. The organs of flight are much more elongate. Length of body 15.2, length of pronotum 4.7, width of pronotum 6.3, length of tegmen 18.3, width of tegmen 5.8 mm.

Supella supellectilium (Serville)

Scarborough, Tobago, British West Indies, VI, 1 and 11, 1914, (W. E. Broadway), 2 ♂.

Ecuador, (G. Hammond), 1 ♂.

Blattella germanica (Linnaeus)

Cartagena, Colombia, VI, 30, 1920, (P. E. Cheesman), 1 ♀.

Charles Island, Galapagos Islands, VIII, 1924, (Miss Cheesman), 1 ♂.

Ischnoptera ignobilis Saussure

Sapucay, Paraguay, 1903, (W. Foster), 2 ♂.

Ischnoptera argentina Hebard

Villa Ana, Ferrocarril de Santa Fé, Argentina, XI, 1925, and XI, 20, 1923, (K. J. Hayward; one on teazle), 2 ♂, 1 ♀.

Ischnoptera rufa rufa (DeGeer)

Gorgona Island, Colombia, VII and X, 1924, (Miss Cheesman), 1 ♂, 1 ♀, 1 juv. ♀.

Ischnoptera bilunata Saussure

Villa Ana, Ferrocarril de Santa Fé, Argentina, XI, 1925, (K. J. Hayward), 1 ♀.

Xestoblatta festae (Griffini)

In 1916[10] the author described and figured what he believed to be the male sex of this species from Costa Rica and recorded females from Panama. It was not until 1921 that this association of sexes was found to be incorrect, at which time a Colombian male representing true *festae* was described and figured and the Costa Rican insect named *hoplites*.[11]

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[9] Recorded and measured by Hebard, Proc. Acad. Nat. Sci. Phila., 1921, p. 232. The material from Trinidad, French Guiana and Bahia, Brasil, has since been found to represent other species.

[10] Trans. Amer. Ent. Soc., XLII, p. 337, pl. 29, figs. 8 to 11.

Coiba, Panama, IX, (Miss Cheesman), 1 ♂.

In three males now before us the two apical teeth of the dextral cercus show marked variation. In that from Murindo, Chocó, Colombia, the ventral of these teeth is distinctly the larger; in that from France Field, Panama, they are equal, and in the present specimen the dorsal is very much the larger, the ventral being minute.

Xestoblatta hamata (Giglio-Tos)

Gorgona Island, Colombia, VII and X, 1924, (Miss Cheesman), 2 ♀.

These specimens have the interocular space pale instead of dark as in material from Andagoya, Antioquia, Colombia, before us. Very close agreement is shown in the faint facial markings and all other characters, so that we believe the one difference probably attributable to color variation, though males may prove that two closely related species are represented.

Euphyllodromia erythromelas Rehn

Gorgona Island, Colombia, VII, 1924, (Miss Cheesman), 2 ♂.

Euphyllodromia stigmatosoma Hebard

Gorgona Island, Colombia, VII and X, 1924, (Miss Cheesman), 4 ♂, 2 ♀.

These individuals are all somewhat larger and more intensively colored than the originally described specimens and the pale lateral bands of the pronotal disk are distinctly narrower. In other respects close agreement is shown.

The previously unknown female agrees with the males except as follows. Interocular space slightly broader. Tegmina and wings very slightly less elongate. Ventral surface of abdomen very broadly blackish brown, this marking narrowing to base of subgenital plate, which has a broad medio-longitudinal band of blackish brown expanding slightly meso-proximad and decidedly in distal portion. Length of body 9.8, interocular width

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[11] Hebard, Trans. Amer. Ent. Soc., XLVII, p. 127.

.92, length of pronotum 2.9, width of pronotum 3.9, length of tegmen 10.8 mm.

Euphyllodromia histrio (Saussure)

This species was originally described as *Pseudophyllodromia histrio,* based on a female from Venezuela. The following year the author, more fully diagnosing the same specimen, changed the name to *hystrix*[12] and gave Colombia (probably in its broadest sense) as the locality. We have recently examined the type (still in the Geneva Museum though belonging to the Paris Museum) and find that all has been destroyed except two wings, one leg and the apex of the abdomen.

Gorgona Island, Colombia, X, 1924, (Miss Cheesman), 1 ♂.

This specimen agrees fully with the original description except that the interocular area (originally given as russet) is chestnut brown with three vertical lines (almost equal in width to the intervening spaces) of pale ochraceous tawny. A female from Ecuador recorded by us in 1924 has this area russet with the three vertical paler lines very weakly indicated, and this we believe was very similar in the type. The present specimen is otherwise clearly the more recessive and this we believe accounts for the fact that the palpi are whitish suffused with blackish only along the ventral margin of the ultimate joint, whereas in the Ecuadorean female these appendages are russet with ultimate joint black. The limbs also show color variation, the tibiae flecked with brown in all but the type, that specimen having them "bordered with brown below" and the femora "bordered with brown above", the femora bordered with brown above only on the cephalic face but with all ventral margins suffused in the present specimen, and darker in general coloration but immaculate in the Ecuadorean female. We are strongly of the opinion that all these differences are attributable to individual variation.

Euphyllodromia fasciatella (Saussure)

Kartabo, British Guiana, IX and X, 1922, (M. D. Haviland), 2 ♀.

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[12] Apparently making the gender conform with that of the genus, but in this case we believe that *histrio* must hold, much as *rex* could not be changed to *regina.*

Pseudomops neglecta Shelford

Villa Anna, Ferrocarril de Santa Fe, Argentina, XII, 1925, to II, 1926, (K. J. Hayward), 3 ♂, 1 ♀.

Pseudomops brunneri (Saussure)

Kartabo, British Guiana, X, 1922, (M. B. Haviland), 1 ♂.

The described "fascia intramarginale postica fuscescente" of the pronotum is incomplete and vague in the present specimen, which otherwise agrees with the very inadequate original description.

Our specimen closely resembles *P. affinis* (Burmeister) in the strongly plumose antennae, very slender form and size.

Pseudomops affinis (Burmeister)

Kartabo, British Guiana, VII, 1922, (M. D. Haviland), 1 ♀.

Para Brazil, (C. F. Baker), 1 ♀, [Acad. Nat. Sci. Phila.].

The Para female, except that it is more intensively colored, agrees in every way with the female from St. Jean du Maroni, French Guiana, discussed by us in 1926[13].

That from Kartabo may represent a distinct species. The pronotum is solidly black except for very narrow lateral and caudal margins and the translucent areas of the tegmina, except in the costal field, are much more obscured. This individual is seen to agree closely with the male described as *Pseudomops affinis* var. ? from "Saint Paul" (= Sao Paulo, Brazil) by Walker in 1868[14].

We know that numerous species of this group exist and that in some are shown wide individual color variation. Until better understood, the differences between the specimens here recorded had best be attributed to that.

BLATTINAE

Pelmatosilpha lata new species (Pl. XIV, figs. 1 and 2.)

This insect is nearest *P. alaris* (Saussure) from Brazil, differing mainly in its very much larger size; males, but not females, exceeding in size even *P. praestans* Dohrn of the upper Amazon, previously the largest known species of the genus.

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[13] Proc. Acad. Nat. Sci. Phila., LXXVIII, p. 190.

[14] Cat. Blatt. British Mus., p. 79.

Like in *alaris* the produced portion of the male supra-anal plate has its lateral margins scarcely convergent, those margins decidedly convergent in *P. guianae* Hebard.

The paler coloration of the cephalic margin of the pronotum and occiput in *alaris* may have little significance, as in the series of *lata* all have these areas uniform except a single female, evidently recessive in coloration, in which the pronotum shows slight paling cephalad and meso-caudad and the interocular space in its dorsal portion is slightly paler (but certainly not banded as described for *alaris*).

Type.— ♂ ; Kartabo, British Guiana. (William Beebe.) [Academy of Natural Sciences of Philadelphia, Type no. 5479.]

Size very large, form broad for the genus. Head smooth and broad, face feebly convex. Interocular space very broad, slightly wider than space between antennal sockets. Ocellar spots small, distinctly defined in color only. Pronotum broad, transversely weakly convex with a very feeble triangular impression meso-caudad, this flanked by very feeble rounded impressions; greatest width toward caudal margin which is very broadly and evenly convex. Tegmina slightly surpassing supra-anal plate, with apices very broadly rounded, surface coriaceous, smooth and polished and moderately convex; veins apparent only in marginal field and distad, anal sulcus distinct only in distal third. Abdomen with latero-caudal angles of tergites aciculate produced, this gradually increasing to sixth where it is decided. Supra-anal plate strongly produced between cerci, with lateral margins there nearly straight and very faintly convergent to the broad, bilobate apex[15]; dorsal surface (as in *guianae*) shallowly impresso-punctate, these the sockets of stiff hairs, narrowly reflexed laterad and then sloping faintly dorsad to a weak medio-longitudinal ridge. Subgenital plate symmetrical, strongly emarginate at the base of the similar, faintly incurved, slender, elongate styles; median portion between these produced and broadly bilobate. Limb spination heavy. Caudal metatarsus slightly longer than the combined length of the three succeeding joints. Pulvilli and arolia large. Tarsal claws heavy, simple, symmetrical.

Allotype.— ♂ ; same data as type. [Acad. Nat. Sci. Phila.]

Agrees closely with male, differing as follows. Size slightly smaller (due probably to individual variation), form no broader.

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[15] This bilobation slightly weaker than in *guianae* and stronger than figured for *alaris*.

Interocular width and tegminal development similar. Supra-anal plate as strongly produced but tectate and even more hirsute; lateral margins straight and very weakly convergent to the broad and even more strongly bilobate apex. Subgenital plate normal, valvular.

Measurements (in millimeters)

	Length of body	Length of pronotum	Width of pronotum	Length of tegmen	Width of tegmen
♂					
Tumatumari. *Paratype*	46.7	13	18.8	36.6	17.5
Kartabo. *Type*	44	12.3	17.6	34	15.7
Kartabo. *Paratype*	38.5	12.2	17.7	33.7	16
♀					
Kartabo, *Allotype*	41	11.8	17	33.3	15.4
Demerara. *Paratype*	40.5	11.2	16.7	31.7	15

The caudal tibia measures: ♂ 16.8, 15.7 and 16.2; ♀ 16.2 and 15.7; the caudal metatarsus ♂ 5.4, 4.9 and 4.8; ♀ 4.8 and 4.8 mm.

General color shining blackish chestnut with a strong reddish tinge and with a distinct purplish iridescence proximad on tegmina, paling to deep chestnut distad on tegmina and in one paratype on pronotum broadly along cephalic margin and meso-caudad, the exposed dorsal portion of the interocular space similarly paler. Ventral surface almost black except lateral portions of pronotum which are rich translucent reddish liver brown. Ocellar spots pale orange yellow.

Specimens Examined.—10; 3 males, 2 females and 5 immature individuals.

Kaiteur, British Guiana, VIII, 19, 1911, 1 large juv. ♂, [Amer. Mus. Nat. Hist.].

Tumatumari, Potaro River, British Guiana, VI, 25, 1927, (Forbes), 1 ♂, [Cornell Univ.].

Kartabo, British Guiana, IX, 1922, (M. D. Haviland; from bromeliad), 1 large juv. ♂, [British Mus.]; (William Beebe), 2 ♂, 1 ♀, *type, allotype, paratype*, 1 large juv. ♂, 3 small juv., [Acad. Nat. Sci. Phila. and Hebard Cln.].

Demerara, British Guiana, 1 ♀, [British Mus.].

Lamproblatta meridionalis (Bruner)

This species, originally referred to *Blatta* (*Stylopiga*) is closely related to the genotype, *L. albipalpus* Hebard. They may be separated as follows.

A. Longer and more slender. Palpi and limbs more elongate. Caudal metatarsus longer and more slender in both sexes, not specialized in male. Male supra-anal plate with broadly truncate apex very broadly convex and lateral angles broadly rounded. Male genital hook with sharp elbow and apical reflexed lobe short. Male subgenital plate with margins not concave at styles. Female supra-anal plate with lateral margins rounding evenly into the rather broadly convex apex. Trinidad. .... *meridionalis* (Bruner)

AA. Shorter and broader. Palpi and limbs shorter. Male supra-anal plate with broadly truncate apex concave and lateral angles acute or rounded. Male genital hook with rounded elbow and apical reflexed lobe elongate. Male subgenital plate with margins concave at styles. Female supra-anal plate with broad apex decidedly concave and lateral angles acute. Panama to Colombia....... *albipalpus* Hebard

Port of Spain, Trinidad, (H. Caracciola), 1 juv. ♀.

Trinidad, 1924, (Miss Cheesman), 1 ♂.

A topotypic female, taken with the type in Trinidad by Chipman, is in the author's collection. The pair here treated measure as follows; length of body ♂ 15 (estimated), ♀ 20; greatest width of body ♂ (mesad) 6.7, ♀ (meso-caudad) 9; length of caudal tibia ♂ 6.7, ♀ 7.9; length of caudal tarsus ♂ 4.7, ♀ 5 (estimated); length of caudal metatarsus ♂ 2.8, ♀ 3 mm.

The immature specimen here recorded has two large transverse areas of buffy on the metanotum, quickly distinguishing it from the early stages of *albipalpus,* in which no such markings occur.

Periplaneta australasiae (Fabricius)

Gorgona Island, Colombia, X, 1924, (Miss Cheesman), 1 small juv. ♂.

Charles Island, Galapagos Islands, VIII, 1924, (Miss Cheesman), 1 small juv. ♀.

NYCTIBORINAE

Paratropes phalerata (Erichson)

Manacas, Trinidad, VI, 2, 1924, (C. L. Withycomb), 1 ♀.

EPILAMPRINAE

Epilampra azteca Saussure

Gorgona Island, Colombia, VII, 1924, (Miss Cheesman), 4 ♀.

Port of Spain, Trinidad, 1911, (H. Caracciola), 1 juv. ♂.

The range of intensification and recession of coloration is very great in this species and the Gorgona Island specimens are all of the extreme intensive type.

Epilampra abdomen-nigrum (DeGeer)

Laudet, Dominica, British West Indies, IV, 1888, 1 ♂, 1 ♀.

Laiou, Dominica, British West Indies, (G. A. Ramage), 1 ♀.

Kartabo, British Guiana, IX, 1922, (M. D. Haviland), 2 ♀.

The specimens from Laudet, Dominica, agree with those reported from Long Ditton on that island by Rehn and Hebard in 1927, in being unusually large, intensively colored and more reddish in color than is usual; that from Laiou, Dominica, however, is much smaller and of the normal color intensity and shade, agreeing closely with the Guianan females.

Epilampra testacea Brunner

Theresopolis, Santa Catharina, Brazil, 1 ♂, 1 ♀.

These specimens represent a species which we have not previously seen, closely related to *E. guianae* Hebard. They agree closely with the inadequate description of *testacea* except as follows. The pronotum of the female is apparently smaller. The head was described as testaceous and having four impressed chestnut punctae in a transverse line between the antennal sockets. In the present pair the occiput is washed with brown with numerous very minute darker punctae and a few dark scattered punctae in the interocular area, the brown suffusion weaker in narrow areas in the occipital-inter-ocular section suggesting vaguely vertical pale lines and again slightly weaker transversely in the interocellar area and reappearing below this only as a large median suffusion. Below this suffusion are a row of six dark punctae arranged in a transverse row curved ventrad and a few flecks of the same are found adjacent to them. This row of flecks is quite as prominent as that between the antennal sockets. Either Brunner failed to note these, his type is a more recessive specimen, or the present specimens represent a closely related but distinct species.

Length of body ♂ 18.3, ♀ 21.3; length of pronotum ♂ 4.7, ♀ 5.6; width of pronotum ♂ 5.7, ♀ 6.8; length of tegmen ♂ 18.2, ♀ 20; length of caudal tibia ♂ 6.7, ♀ 7.2 mm.

Epilampra colombiana Saussure

Chiriqui, Panama, (from Rosenberg), 1 ♂.

Epilampra sagitta new species (Pl. XIV, figs. 3 and 4.)

This dark medium sized species, with pronotum thickly and finely punctulate and tegmina very finely and evenly tessellate is near *E. colombiana* Saussure in pronotal and tegminal marking, but is decidedly smaller with head differently marked and interocular space narrower. Giglio-Tos' *E. josephi* is also apparently close, distinguished by the black head and more extensive and confluent brown tegminal markings.

The present insect is even nearer *E. opaca* Walker, but is larger with meso-lateral impressions of pronotal disk less pronounced and pronotal and tegminal markings more even, the tessellation of the latter toward the humeral trunk being coarser and in greater contrast than elsewhere in *opaca*. The head markings are identical in these two species.

Type.—♂ ; Teffe, Amazonas, Brazil. January 21, 1920. (H. S. Parish.) [Hebard Collection, Type no. 1135.]

Size intermediate between the large and small species of the genus, form slightly more slender than the normal. Interocular space very faintly over one-third that between antennal sockets. Ocellar spots large, well developed, with flat surfaces forming an obtuse angle with plane of interocellar area. Pronotum with lateral portions strongly deflexed, surface showing broad weak impression meso-laterad; point of greatest width meso-caudad, caudal margin with median production decided. Tegmina and wings elongate, surpassing end of abdomen. Ulnar vein of wings with numerous (sixteen in paratype) incomplete and few (three in paratype) complete branches. Abdominal tergites all rounded and not produced latero-caudad. Supra-anal plate subchitinous, decidedly produced, four-fifths as long as broad, lateral margins parallel and straight, then moderately convex just beyond cerci, thence straight and moderately convergent to the moderately bilobate apex; surface rugulose and with a weak medio-longitudinal sulcus except at base. Subgenital plate asymmetrically rounded in median portion as characteristic of genus; styles very slender, simple, cylindrical and slightly decurved, about nine times as long as wide, the dextral situated in a sudden offset of the very broadly concave dextral margin, the sinistral in a socket just below a flattening of the sinistral margin. Cephalic femora with ventro-cephalic margin armed with a row of (four; three in allotype) heavy well-spaced spines, followed by a longer row of minute short spines and with two heavy elongate distal spines; other ventral femoral margins well supplied with heavy spines. Caudal metatarsus very elongate and slender; distinctly longer than combined length of succeeding joints, armed ventrad with two rows of minute spines, which are continued on the two succeeding joints; four proximal tarsal joints each supplied with a moderately large blunt distal pulvillus. Large arolia present between the simple symmetrical and rather delicate tarsal claws.

Allotype.— ♀ ; Manaos, Amazonas, Brazil. September 7 to 9, 1920. [Hebard Collection.]

Slightly larger than male, but smaller than any of the females of *opaca* before us. Differs from male as follows. Interocular space slightly over half width between antennal sockets. Subgenital plate, as in related species, with lateral margins extensively concave below cerci, between them produced, transverse, symmetrically trapezoidal with angles rounded.

General appearance buckthorn brown overlaid with prouts brown (cinnamon brown on tegmina when spread), deepening toward mummy brown on pronotum. Head ochraceous buff with with an inverted Y of blackish brown between the eyes (very thick in allotype), its arms reaching the ocelli, its base (dorsad) sending short rays, through a tawny area, toward the occiput which is also marked with dark brown in two large triangular areas, four minute flecks of brown between and below the arms of the inverted Y in the type, only two such distinct in allotype and two in paratype with below them a faint transverse suffusion. Pronotum buckthorn brown, with very numerous almost microscopic dots of dark prouts brown which mesad fuse enough to indicate an escutcheon without such being well defined, the minute dots being ochraceous tawny in inner half of deflexed lateral portions and there is a buffy fleck cephalad in this area, a very fine streak of the paler ground color indicated particularly meso-cephalad, the cingulate margins ochraceous tawny becoming mummy brown at the latero-caudal angles, inconspicuous and only slightly heavier dark dots present just before the caudal margin. Tegmina tinged with buckthorn brown, thickly and evenly ornamented with very small evenly distributed flecks of reddish cinnamon brown proximad, these gradually expanding, fusing more and paling to buckthorn brown distad; in proximal portion of dextral tegmen concealed when at rest this fusion is almost solid, the remainder of that area immaculate; marginal fields slightly the paler; humeral trunk proximad with flecks on it darker and less separated than elsewhere but in allotype almost solidly dark there, this appearing as a broken line in proximal third of tegmen in type and allotype, but continued beyond median point on tegmen in paratype. Wings tinged with cinnamon brown, veins cinnamon brown; area of costal vains opaque cinnamon brown, with immediate margin alone paler. Mesonotum, metanotum and abdomen dorsad cinnamon brown, each tergite distad darker with a paler area meso-laterad (in each of which is a proximal dark marking in allotype and paratype), base of supra-anal plate darkened. Ventral surface and limbs ochraceous buff, the abdomen with numerous very minute and well scattered dark brown flecks, the tibiae with very similar inconspicuous flecks of brown at bases of dorsal spines, the tarsal joints each suffused with brown at apices.

The measurements of the type are followed by those of a male paratype from Obidos, Pará, Brazil, taken February 2, 1896, by E. E. Austin. Length of body ♂ 23.5 (estimated) and 24 (abdomen extruded), ♀ 25.6; length of pronotum ♂ 5.8 and 6, ♀ 6.7; width of pronotum ♂ 7 and 7, ♀ 7.8; length of tegmen ♂ 22.5 and 22, ♀ 25.2; width of tegmen ♂ 6.6 and 6.8, ♀ 7.3 mm.

A male in the author's collection from Rio de Janeiro, Brazil, agrees very closely in size, general coloration and character of markings with these specimens, but apparently represents a distinct though closely related species.

Epilampra opaca Walker

Venezuela, 1 ♀.

Epilampra mexicana Saussure

Chiriqui Volcano, Panama, (Heyne Collection), 1 ♀.

Epilampra atriventris Saussure

Theresopolis, Santa Catharina, Brazil, 2 ♂, 1 ♀.

The head in the species is distinctively marked. It is buffy with area beginning just below dorsal margins of eyes to below ocelli blackish brown.

The male agrees closely with the female except that the interocular space is distinctly instead of slightly less than one-half the interocellar width, the ventral surface of the abdomen is pale and the tegmina and wings are fully developed instead of considerably reduced.

Length of body ♂ 30, ♀ 29; length of pronotum ♂ 8.8, ♀ 7.8; width of pronotum ♂ 10, ♀ 10.2; length of tegmen ♂ 32.6, ♀ 20.3; length of caudal tibia ♂ 10.7, ♀ 10 mm.

Epilampra delicata new species (Pl. XIV, figs. 5 and 6.)

This south Brazilian insect would seem to be near the Argentinian species *E. berlandi* Hebard and *E. jorgenseni* (Rehn), species in which the very different appearing females have lateral pad-like tegmina. The males agree in having the coloration grayish instead of reddish and in numerous features of color pattern.

Shelford's *Audreia catarina,* described in 1910 from Santa Catharina, Brazil, is, however, apparently even more closely related, though showing decided reduction in the organs of flight in males, the tegmina being quadrate in females.

Agreement in a number of features with *delicata* is also found in the Brazilian *E. latifrons* Saussure and Zehntner, that insect being, however, considerably smaller, fulvo-testaceous in general coloration, with decidedly wider interocular space and immaculate ventral surface of abdomen.

Type.—♂ ; Tijuca, Organ Mountains, Rio de Janeiro, Brazil. 600 to 900 meters. (E. R. Wagner.) [Hebard Collection, Type no. 1151.]

Size small, form moderately graceful for the genus. Interocular space about three-fifths width between antennal sockets, very near width between ocellar spots. Those large, with flattened surfaces forming an obtuse angle with plane of the face.

Pronotum with lateral portions strongly deflexed, point of greatest width meso-caudad, lateral impressions of disk almost obsolete, caudal margin with median production decided; dark points not impressed[16]. Tegmina and wings elongate, well surpassing the very slender apices of the cerci. Ulnar vein of wing with numerous incomplete and few complete branches. Abdominal tergites all rounded latero-caudad and not produced caudad. Supra-anal plate subchitinous, decidedly produced, bilobate. Subgenital plate and position of styles as here described for *E. sagitta;* the styles, however, shorter, about seven times as long as wide. Limbs as described for *sagitta,* (in the series the number of large spines proximad on the ventro-cephalic margin of the cephalic femora is three to five, usually four).

General coloration testaceous, diaphanous, the general appearance grayish rather than ferruginous, but the specimen from Guaraja slightly more ferruginous than the others. Head ochraceous buff, the occiput with two large irregular areas of mummy brown toward its base separated by a fine pale median line, a broad area of mummy brown between all but the dorsal portion of the eyes, this narrowly continued on each side along the margins of the ocelli ventrad (there terminating in some, varying to almost meeting horizontally in others). This dark area is in one specimen cleft by a fine vertical median pale line, such being faintly indicated in two others. In one specimen there are two faint brown flecks below this dark area. Palpi buffy with last two joints or distal half of last joint mummy brown. Pronotum tinged with testaceous with many very minute and a few small scattered dots of tawny, the larger of these often dark brown and much more pronounced along the caudal margin than elsewhere, disk showing a distinct lyrate pattern of disconnected lines of mummy brown, this not as much developed or with the lines which make it broader in *conferta,* but of very similar type. Tegmina very delicate, tinged with testaceous and showing widely scattered flecks of tawny, these more numerous and approaching mummy brown in one intensively colored specimen; humeral trunk proximad mummy brown in distinctly less than pronotal length; area of dextral tegmen concealed when at rest immaculate. Wings tinged with testaceous, area of costal veins toward costal margin broadly opaque light ochraceous buff. Dorsal surface of abdomen saccardos umber with five tergites each showing a large buffy patch laterad. Ventral surface ochraceous buff, the abdomen with many but well scattered minute dots of brown and five sternites each with a dot of dark brown meso-laterad. Limbs buffy, the cephalic femora with a dorsal line of dark brown, this faintly indicated on the other femora, tarsal joints often suffused with dark brown distad.

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[16] This easily distinguishes *delicata* from the Amazonian *E. conferta* Walker, material of that species before us showing that the pronotal punctulae and few punctae are all impressed.

The measurements are given in the order in which these males are recorded below. Length of body 17.7, 19, 18.5, 18; length of pronotum 4.6, 4.8, 4.9, 4.4; width of pronotum 5.7, 5.8, 6, 5.8; length of tegmen 17.8, 19.8, 19.1, 19; width of tegmen 5.7, 5.9, 6, 5.8 mm.

Specimens Examined.—4; 4 males.

Tijuca, Rio de Janeiro, Brazil, (E. R. Wagner), 1 ♂, *type*, [Hebard Cln.].

Petropolis, Rio de Janeiro, Brazil, X, 24 to 27, 1919, (R. G. Harris), 1 ♂, *paratype*, [Cornell Univ.].

Guaraja, Sao Paulo, Brazil, XII, 2, 1919, 1 ♂, [Hebard Cln.].

Parana, Brazil, (E. D. Jones), 1 ♂.

Epilampra cribrosa Burmeister

Organ Mountains near Tijuca, Rio de Janeiro, Brazil, (S. R. Wagner), 1 ♂.

A female bearing the same data is in the author's collection.

We have recently examined the female type of *Epilampra repanda* Walker in the British Museum and find it to be a synonym of *cribrosa*, if material in that collection determined as *cribrosa* has been correctly identified.

The specimens agree closely with the very insufficient original descriptions, both of which, however, mention the costal margin of the wings as being broadly fuscous (*cribrosa*) or testaceous (*repanda*). In our material this margin is conspicuously flecked with brown to near the base, of much the shade of the tegmina proximad in the male, darker in the female. The general coloration is light yellowish brown, the tegmina thickly flecked with this color and with ocellations beyond the proximal portion (these prominent only in the area of the dextral tegmen, concealed when at rest).

Length of body ♂ 26.8, ♀ 30; length of pronotum ♂ 7, ♀ 8.3; width of pronotum ♂ 8.5, ♀ 11.5; length of tegmen ♂ 28, ♀ 31.2; width of tegmen ♂ 8.8, ♀ 11 mm.

Epilampra shelfordi Hebard

Rio Dagua, Colombia, 1 ♀.

This specimen agrees closely with the type except in its larger size and the presence of even more numerous black flecks on the tegmina. Length of body (abdomen extruded) 33, length of pronotum 7.2, width of pronotum 9.3, length of tegmen 31, width of tegmen 9.2 mm.

Audreia gatunae Hebard

Gorgona Island, Colombia, X, 1924, (Miss Cheesman), 1 ♀.

This specimen agrees closely with the type except that the latero-caudal angles of the pronotum and the tegmina at the costal margin are roundly and not strongly, though distinctly produced.

Hyporhicnoda litomorpha Hebard

Chiriqui Volcano, Panama, (from Rosenberg), 1 ♂.

Material before us shows this insect to be decidedly variable not only in size but also in amplitude of male tegmina. In these features the present specimen approaches the maximum known for the species. Length of body 24, length of pronotum 7.2, width of pronotum 10.6, length of tegmen 26.8, width of tegmen 9.8, length of caudal tibia 7.9 mm.

Phoraspis flavipes Blanchard

Organ Mountains near Tijuca, Rio de Janeiro, Brazil, (E. R. Wagner), 1 ♀.

This specimen agrees fully with a female bearing the same data in the author's collection, except in being somewhat larger; length of body 17.8, length of pronotum 6, width of pronotum 8.8, length of tegmen 17.8 mm.

Phoraspis blanchardi new species (Pl. XIV, fig. 7.)

This insect is closely related to *P. brachytaenia* Hebard. That species may be separated by the much broader pale cephalic margin of the pronotum which is narrowest mesad, the solidly almost black pronotum in other portions and the tegmina appearing almost uniform black except for the vinaceous-rufous lateral band.

Type.—♂; Parana, Brazil. (E. Dukinfield Jones.) [British Museum.]

Size and form about intermediate between *brachytaenia* and *P. picta* (Drury). Interocular space distinctly, instead of slightly, narrower than that between the ocellar spots. Structure apparently otherwise similar, (color often being of primary importance in distinguishing the species of the genus).

Head blackish brown with occiput to between median portion of eyes light tawny. Antennae with all joints blackish brown. Pronotum with entire cephalic margin testaceous, this faintly narrower mesad than laterad; other portions rich translucent chestnut brown. Tegmina dorsad and ventrad with anterior margin broadly black proximad, this broadening beyond a broad humeral band of hays russet, (deeper but of identical proportions in *brachytaenia*) beyond that blackish brown and gradually disappearing into the general coloration which is rich translucent chestnut brown paling to deep hazel distad. The tegmina, on closer examination, are seen to be supplied with numerous minute scattered black dots[17]. Wings tinged with brown, the veins brown except in area of costal veins where they are hazel, (there chestnut brown in *brachytaenia*). Mesonotum,, metanotum, abdomen, ventral surface and limbs shining black with a faint tinge of brown.

Length of body 16.2, length of pronotum 5.1, width of pronotum 6.8, length of tegmen 15.7, width of tegmen 7.2, length of tegminal taenia 6.3, width of tegminal taenia 1.8 mm.

Phoraspis brachytaenia Hebard

Santa Catharina, Brazil, 1 ♂.

A male bearing the same data and a female from Theresopolis in that State are in the author's collection. The present material agrees closely with the originally described series except in being of somewhat larger size.

Panchlora cubensis Saussure

Port of Spain, Trinidad, I, 14, 1924, (S. A. Neave), 1 ♀.
Scarborough, Tobago, VI, 1, 1914, (W. E. Broadway), 1 ♂.
Merida, Venezuela, 1 ♀.
Demerara, British Guiana, 1 ♀.
Rio Demerara, British Guiana, 2 ♂, 2 ♀.
Kartabo, British Guiana, VII, 1922, (M. D. Haviland), 1 ♂.
Taboga Island, Panama, IX, 1924, (Miss Cheesman), 1 ♀.
Ponta Grossa, Parana, Brazil, (C. Slonczewska), 1 ♀.
Pernambuco, Brazil, 1 ♂.

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[17] Such are also present in *brachytaenia*, but were overlooked originally, due to the very dark general coloration of the tegmina in that species.

Panchlora thalassina Saussure and Zehntner

Villa Ana, Ferrocarril de Santa Fé, Argentina, XII, 3, 1923, and I, 1925, (K. J. Hayward), 1 ♂, 1 ♀.

Panchlora bidentula Hebard

Mosqueiro, Rio de Para, Brazil, III, 7, 1896, (E. E. Austin), 1 ♂.

Panchlora nivea (Linnaeus)

Rio Demerara, British Guiana, 3 ♂.

This is the smallest known species of the genus. The present specimens measure in length, including tegmina, from 12.4 to 14.2 mm.

Pachlora sagax Rehn and Hebard

Laiou, Dominica, British West Indies, (G. A. Ramage), 1 ♂.
Laudet, Dominica, British West Indies, IV, 1888, 1 ♂.
Dominica, (G. A. Ramage), 1 ♀.

Panchlora prasina (Burmeister)

Rio Grande do Sul, Brazil, 1 ♀.

This is the largest specimen we have seen of *prasina,* the largest species of the genus. Length of body 28, length of pronotum 8.7, width of pronotum 10.1, length of tegmen 30.1, width of tegmen 9.7 mm.

Panchlora fraterna Saussure and Zehntner

Issororo, N. W. D., British Guiana, XII, 1918, (G. E. Bodkin), 1 ♂.

In this specimen the interocular space is very narrow (.17 mm.), the antennae have seven subapical joints darkened and the tegmina each have a median dot on the humeral vein and another meso-distad in the discoidal field. The cerci are short, tapering decidedly beyond the immediate base to the last joint which is slightly longer than broad and narrows to its strongly rounded apex. The styles are short, straight, slender and about two-thirds as long as the cerci. The margin of the subgenital plate is broadly concave from the dextral style to near the median point, thence broadly convex to the sinistral style. Length of body 12.2, length of pronotum 4, width of pronotum 5.2, length of tegmen 13.8, width of tegmen 5 mm.

Panchlora azteca Saussure

Mexico, 2 ♀.

We record these specimens without exact data as, though the one is typical, the other though decidedly more recessive in general coloration has the ventral surface of the abdomen ornamented with much darker and more sharply defined markings. This specimen differs as follows. Interocular space three-fifths instead of one-half occipital ocular depth, with dark brown patch not as deep (its greatest, dorsal, width slightly greater than its depth). Pronotum slightly paler, light ochraceous buff with lateral black lines slightly finer. Tegmina evenly pale ochraceous buff proximad becoming transparent and even paler distad with dark bluish humeral line inconspicuous, a minute brown dot in proximal portion of humeral field followed by another disto-suturad, so small as to be visible only under magnification (in other specimen a larger homologous dot on one side but absent on the other tegmen, a median dot on humeral vein on each tegmen and another in median portion of discoidal field distad on each tegmen). Ventral surface of abdomen with first sternite and subgenital plate showing very feebly, the other sternites strongly, an irregular black area on each side, each with an invasion of the light buff general coloration, forming together striking dark lateral bands, (instead of all but the subgenital plate suffused with brownish buff as in the other specimen).

Series will alone determine whether or not these differences are due to individual variation.

The measurements of the recessive specimen are given last; length of body 19.2 and 18, length of pronotum 6.9 and 6.7, width of pronotum 8.1 and 7.7, length of tegmen 22.5 and 20.2, greatest (distal) width of tegmen 7.8 and 7.7 mm.

Panchlora pulchella Burmeister (Pl. XIII, fig. 10.)

Rio de Janeiro, Brazil, (J. T. Maury), 1 ♂, *topotype.*

This specimen is of great interest as not only is *pulchella* the genotype of *Panchlora,* but the species has been repeatedly misidentified.

Stoll's Brazilian *quadripunctata* (1813) is a very different insect, though *pulchella* (1838) was placed as a synonym by Saussure and Zehntner and also by Kirby.

Brunner's Brazilian material, discussed and figured as *pulchella* in 1838 probably represents *quadripunctata* or a closely related species.

Saussure's *mexicana*, described from that country in 1864 (at which time a specimen of true *pulchella* from Brazil was also diagnosed) is a species related to *P. zendala* Saussure and not a synonym of the present insect, as was indicated by Saussure and Zehntner in 1893 and by Kirby in 1904.

We figure here the distinctive tegminal marking of the present insect. The antennae show a few joints slightly darkened in meso-proximal portion; the distal portions are missing in our specimen. The cerci taper suddenly from their enlarged bases to their slender apices, the last joint being slightly over twice as long as its width and with apex strongly rounded. The styles are simple, straight, very slender and elongate, extending as far as base of last cercal joint. The margin of the subgenital plate between the styles is irregularly broadly convex, this beginning a distance beyond the dextral style but nevertheless slightly strongest dextrad of the median portion.

Length of body 14.5, length of pronotum 4.9, width of pronotum 6.8, length of tegmen 20, width of tegmen 6.8 mm.

Tribonidium transversa (Brunner)

Iguassu, Rio de Janeiro, Brazil, XII, 1917, (W. Ehrhardt), 1 ♂.

This specimen agrees closely with males of *T. signaticollis* (Burmeister) in the author's collection except in the darker and more glossy general coloration, pronotum smoother with very much fewer and finer impressed punctulae, shorter organs of flight and pale lateral margins of the dorsal surface of the abdomen. The pronotal width in this specimen is only slightly greater.

Length of body 14, length of pronotum 4.8, width of pronotum 7, length of tegmen 13.3 mm.

Capucinella fragilis new species

1919. *Capucinella delicatula* Hebard (in part—♂, not ♀), Mem. Amer. Ent. Soc., No. 4, p. 112, pl. 6, fig. 2. [♂; Porto Bello, Panama.]

A male from Panama of this species was incorrectly supposed to represent this sex of *fragilis* at the time that species was described, based on a female from the Santa Marta Region of Colombia. Twenty-five specimens of *fragilis* now before us, including males, enable us at the present time to separate these species.

The present insect may be distinguished by the immaculate face in both sexes; in the male by the much smaller size, median pronotal suffusion extending cephalad more narrowly with its lateral margins more sharply defined and the even more diaphanous tegmina with minute maculations even fewer and less conspicuous; in the female by the smaller size and even more delicate and diaphanous broad margins of pronotum to supra-anal plate.

Type.—♂; Porta Bello, Panama[18]. March 10, 1911. (E. A. Schwarz.) [United States National Museum.]

Size small, form moderately broad. Eyes large, subattingent. Palpi with fourth and fifth joints subequal in length, each slightly shorter than third. Antennae much more elongate than in female, but with joints very small except the first and the distal joints gradually lengthen to three times as long as wide. Caudal margin of pronotum showing weak convexities on each side above the humeral trunk of the tegmina. Tegmina extending beyond apex of abdomen a distance equal to the tegminal width; marginal field occupied by an irregular network of very fine veinlets; discoidal field with (eight) moderately radiating discoidal sectors; anal sulcus curving sharply distad toward sutural margin. Wings with (six) incomplete and (three) complete branches of the ulnar vein. Dorsal surface of abdomen with third, fourth and fifth tergites each showing a long delicate transverse ridge proximad; latero-caudal angles of tergites not produced, rectangulate with apices rather broadly rounded except those of seventh tergite which are weakly produced and subrectangulate with apex rather sharply rounded, eighth tergite concealed. Supra-anal plate exceedingly delicate, produced, nearly twice as broad as long; caudal margin almost transverse, very feebly convex; latero-caudal angles very broadly rounded. Cerci short, delicate, not extending as far caudad as caudal margin of supra-anal plate. Subgenital plate roundly produced sinistrad a distance slightly over half that of supra-anal plate, forming dextrad a large and rounded obtuse-angulate emargination from the apex of which springs a slender, straight style, three-quarters as long as the adjacent cercus, with apex furnished with a few minute hairs, (sinistral style broken off or aborted, similar and situated just beyond sinistral cercus in other males now before us).

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[18] Described and figured as allotype of *Capucinella delicatula* by Hebard in 1919.

Allotype.—♀; Urbana, Illinois, (introduced beyond question). February 4, 1907. (In house.) [Hebard Collection.]

Size small, but larger than male, smaller than in this sex of *delicatula* and with margins distinctly more diaphanous; form broad. Eyes strongly reduced, separated by a very wide space, equalling four times the narrow occipital ocular depth. Tegmina and wings absent. Dorsal surface with a medio-longitudinal line which develops into an extremely fine and weak carina in the cucullate portion of the pronotum. Mesonotum, metanotum and abdominal tergites with latero-caudal angles slightly produced latero-caudad, these decidedly less than rectangulate cephalad but becoming rectangulate caudad and very sharply rounded, sixth tergite and supra-anal plate produced slightly beyond cercal apices. Supra-anal plate with lateral margins straight and moderately diverging to the broadly rounded latero-caudal angles, caudal margin very broadly convex and showing slight production mesad (instead of showing a very faint indication of emargination there as in *delicatula*). Subgenital plate simple, truncate meso-distad, with margins slightly concave below cercal bases.

Male with pronotum transparent, hyaline with a faint buffy tinge, except for the meso-caudal area which, in a rather broad, inverted V-shaped space with lateral margins concave, is russet, showing microscopic flecks of buff. On each side of this space is a small triangular opaque whitish area, its outer angle with a dark brown dot[19]. Tegmina and wings transparent, hyaline with a faint buffy tinge, the tegmina in a few flecks and patches washed with cinnamon brown. Remaining portions of dorsal surface light ochraceous buff, washed with russet toward the tegminal and wing bases on mesonotum and metanotum and shading to ochraceous buff meso-distad on abdomen. Head, ventral surface and limbs ochraceous buff, this slightly deeper on femora, while the interocular space at its narrowest point is suffused with brown[20]. Eyes blackish mummy brown. Antennae ochraceous buff proximad, shading to mummy brown in remaining portions (over two-thirds) except terminal (or in one of the present males four terminal) joint which is ochraceous buff. Cephalic tibiae with a minute fleck of prouts brown proximad on cephalic face, so that this is concealed by the slightly produced and rounded genicular lobe of the cephalic femora when these are flexed.

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[19] This same marking is shown by *delicatula*.

Female buffy, the dorsal surface with a very faint microscopic network of cinnamon brown, so that it appears distinctly more buffy and less reddish than in this sex of *delicatula.* Underparts buffy, the abdomen with large brown suffusions laterad on second and fifth sternites and subgenital plate[21]. Head immaculate except for four vague and inconspicuous flecks of brown between the eyes (not visible to the naked eye). Antennae with several of the apical joints buffy. Cerci with a large suffusion of dark brown meso-dorsad and a smaller one mesoventrad.

In twenty-five specimens of *delicatula* at hand an interocellar dark brown band is always present and constitutes one of the most striking differences from *fragilis.* We believe it to be quite possible that the adventive females, originally recorded as *delicatula,* may represent a third undescribed species, as in them the dark facial marking is much more elaborate.

The measurements of the male type are followed by those of two males, taken on Gorgona Island, Colombia, in July, 1924, by Miss Cheesman. Length of body ♂ 13.5, 12.3, 12; ♀ 15: length of pronotum ♂ 4.9, 4.7, 4.7; ♀ 5.2: width of pronotum ♂ 7.2, 6.7, 6.6; ♀ 8.8: length of tegmen ♂ 14.2, 13.3, 13: width of tegmen ♂ 5.7, 5, 4.9 mm.

BLABERINAE

Archimandrita tessellata Rehn

Andagoya, Rio Condoto, Antioquia (Chocó), Colombia, (H. G. F. Spurrell), 1 ♀.

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[20] This marking is also present in males of *delicatula.*

[21] No medio-longitudinal brown suffusion is shown as is found in this sex of *delicatula.*

Blaberus parabolicus Walker

Nivac, Matto Grosso, Brazil, (E. D. Jones), 1 ♀.

The dark pronotal marking, normally shield-shaped, is in this specimen moderately extended laterad forming angles directed toward the points of pronotal greatest width and is consequently irregular hexagonal. In the series before us a weaker development of similar character is found in a single Colombian female.

Blaberus atropos (Stoll)

Mahaicony, British Guiana, IV, 25, 1907, (A. W. Bartlett), 1 ♂.

Blaberus discoidalis Serville

Santiago de Cuba, Cuba, IV, 1895, (C. A. Wray), 1 ♀.

Blaberus minor Saussure

Villa Ana, Ferrocarril de Santa Fé, Argentina, XII, 1923, (K. J. Hayward), 4 ♂.

Eublaberus biolleyi (Rehn)

Chiriqui Volcano, Panama, 1 ♀.

The pronotal markings are even more recessive in this specimen than in the type.

Eublaberus posticus (Erichson)

Isororo, N. W. D., British Guiana, VI, 1915, (J. E. Bodkin), 1 ♀.

This specimen shows a moderately intensive pronotal marking.

Blaptica dubia (Serville)

Ajo, Buenos Aires Province, Argentina, VII to IX, 1919, (H. E. Box), 1 ♀, 1 large juv. ♂.

CHORISONEURINAE

Chorisoneura argentina Brancsik

Villa Ana, Ferrocarril de Santa Fé, Argentina, XII, 1914, (K. J. Hayward), 1 ♂.

We believe that *argentina* is a valid species, not a race of *minuta* Saussure, as has been suggested by Kirby.

The present specimen is teneral. The pronotal width is 2.8 mm. (not 3.7 apparently incorrectly given for *argentina*, probably for 2.7, as the tegminal width was given as 2.5). The head is brownish buff with a fine line of slightly darker shade between the eyes bordered ventrad by a broad band of buff. The pronotal disk is yellowish buff. The tegmina (plainly teneral) are translucent with a faint testaceous tinge, with very weakly indicated tessellation particularly meso-distad. The styles are two large convex plates, the sinistral covering that side of the subgenital plate, transverse, extending distinctly dextrad of a median line.

Length of body (abdomen extruded) 7.8, length of pronotum 1.8, width of pronotum 2.8, length of tegmen 7.8, width of tegmen 2.7 mm.

Chorisoneura nigrostriga new species (Pl. XIV, fig. 8.)

Of thirty-seven species of *Chorisoneura* now before us this insect is nearest the Mexican *C. pellucida* Saussure, these species agreeing very closely in size, form and tegminal venation. From it *nigrostriga* is distinguished by the tegmina being decidedly more acute distad, the slightly deeper and more uniform coloration of the pronotal disk and inner portions of the tegmina, broad black interocular band and black proximal portions of the antennae.

It agrees quite closely with the Brazilian *C. lata* Rehn in size, form and tegminal coloration. That species shows different marking of the interocular area and pronotal disk and has the tegmina slightly less acute distad.

Type.—♂ ; Gorgona Island, Colombia. July, 1924. (Miss Cheesman.) [British Museum.]

Size rather large for the genus; form depressed, in outline elongate elliptico-ovoid. Head broad, decidedly depressed; occiput and cephalic half of eyes exposed dorsad, eyes not projecting beyond interocular area; interocular space broad (.75 mm.), about three-quarters width between antennal sockets. Palpi elongate, third joint distinctly longer than fourth and fourth slightly longer than fifth. Pronotum transverse elliptical; cephalic margin very broadly convex, caudal margin almost transverse, faintly convex, lateral margins more convex and very evenly rounding into the other margins; point of greatest width slightly caudad of median line; disk with very shallow lateral impressions and very fine sulci above head which diverge toward cephalic margin. Tegmina elongate, extending to cercal apices, greatest width at proximal fourth, narrowing distad to the sharply rounded but acute apex; marginal field broad, costal veins (fifteen) extremely fine, discoidal sectors (thirteen) very strongly oblique. Wings with intercalated triangle longer than wide. Sixth abdominal tergite with a median depression supplied with agglutinated hairs. Genitalia distorted from immersion in alcohol, styles apparently moderately elongate, with a minute spine between their bases curved sinistrad. Limbs as characteristic of the genus.

Head buffy with a faint tawny tinge, a broad band of blackish brown between the eyes, including the area from their dorsal margins to point of least separation. Antennae with first joint and nearly distal two-thirds buffy, second joint buffy ringed with brown, remaining portion blackish brown. Pronotal disk immaculate, light ochraceous tawny; lateral portions and tegmina toward costal margin transparent and almost colorless; other portions of tegmina with veins and veinlets the same but areas between these weakly tinged with ochraceous tawny. Wings weakly tinged with ochraceous tawny, the strongly enlarged apices of the (twelve) costal veins opaque buff. Ventral surface and limbs translucent light buff; but abdominal sternites rich ochraceous tawny with distal half translucent whitish; subgenital plate and styles buffy with a faint tawny tinge.

Length of body 9.7, length of pronotum 2.3, width of pronotum 3.7, length of tegmen 9.7, width of tegmen 3 mm.

Chorisoneura splendida Hebard

Kartabo, British Guiana, VI, 1922, (M. D. Haviland), 1 ♂, *topotype*.

Chorisoneura wayana Hebard

Kartabo, British Guiana, IX, 1922, (M. D. Haviland), 1 ♂.

This specimen agrees fully with the type except in being generally of a very slightly paler reddish brown, while all but the disk of the pronotum is transparent tinged with ochraceous tawny.

Chorisoneura colorata new species (Pl. XIV, fig. 9.)

This beautiful little insect is closely related to *C. albonervosa* Rehn, now known from French Guiana and Pará, Brazil, agreeing in form, the striking occipital markings, black antennae, pronotum with broad opaque whitish marginal bands cephalad and caudad and tegmina with opaque whitish veins.

It is of slightly larger size and the pronotal disk, though similarly unusually variable in color, when dark does not become wholly so, but leaves large pale lateral areas meso-caudad on each side. In addition the veins of the tegmina are decidedly more numerous and those so defined are decidedly more delicately outlined in opaque whitish.

Type.— ♂ ; Gorgona Island, Colombia. October, 1924. (Miss Cheesman.) [British Museum.]

Size below medium for genus, form intermediate between the narrow and the broad species but tegmina tapering to the sharply rounded apices as in the latter. Head with interocular space two-thirds width between antennal sockets, slightly narrower than in *albonervosa.* Palpi with fifth joint nearly as long as third, distinctly longer than fourth. Pronotum transverse, subelliptical, greatest width very slightly caudad of a median line, latero-caudal angles very faintly less broadly rounded than the latero-cephalic, cephalic margin with distinct convexity above the head. Tegmina surpassing supra-anal plate by fully the pronotal width, moderately broad proximad, tapering to the sharply rounded apices; anal field with five regular axillary veins (three to four such, irregularly placed, in *albonervosa*); costal veins (thirteen in type and paratype, fourteen in other paratype) with intervening false veinlets; discoidal sectors (twelve in type, thirteen in paratypes, counting several extreme distal branches of some of the veins[22]. Supra-anal plate weakly triangularly produced with apex decidedly broadly rounded. Subgenital plate with lateral margins briefly declivent to the styles, between the bases of which is a minute process apparently armed with two short curved teeth. Styles heavy proximad with large lateral lamellae, very slender in distal half, total length about one and one-half width across their bases. Limbs as characteristic of genus.

Head black with a moderately broad whitish bar at point of least width between eyes; below this a line of whitish slightly convex dorsad and laterad continued down along the eyes to the antennal sockets. Palpi and mouthparts buffy. Antennae black, becoming brown distad. Limbs and cerci translucent ochraceous buff, ventral surface of abdomen tinged with tawny. Pronotum very broadly margined cephalad and broadly caudad with whitish; disk blackish brown paling laterad (latero-caudad in the type, latero-mesad in a paratype) through tawny to buffy (in one paratype tawny, this slightly deeper latero-cephalad). Lateral portions of pronotum and tegmina transparent and almost colorless, other portions of tegmina with all veins very finely opaque white, the intervening areas prouts brown (paler distad in type). Wings tinged with prouts brown, slightly less than the outer half of the costal field solidly whitish.

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[22] Six to eight tegminal discoidal sectors so counted in our series of *albonervosa*, where particularly in the type a distinctly weaker obliquity of the majority of these is shown.

The measurements of the type are followed by those of two male paratypes, bearing the same data but taken in July. Length of body 8, 8, 8.2; length of pronotum 1.8, 1.9, 1.9; width of pronotum 2.8, 2.9, —; length of tegmen 8.4, 8.7, 8.8; width of tegmen 2.6, 2.7, 2.7 mm.

PERISPHAERINAE

Poroblatta nigra (Brunner)

1892. *Parasphaeria nigra* Brunner, Proc. Zool. Soc. London, 1892, p. 206, pl. 15, fig. 7. [♂, ♀; Soufriere Volcano, west slope, St. Vincent, British West Indies.]

1893. *Parasphaeria rufipes* Brunner, Proc. Zool. Soc. London, 1893, p. 604, pl. 52, fig. 3. [♀; Balthazar, Grenada, British West Indies.]

The original descriptions of *nigra* and *rufipes* are misleading and insufficient. Uvarov has examined the types for us and both, like the specimens here recorded, have a small buffy area tinged with reddish brown around its edges on the cephalic margin of the pronotum on each side of the head. The tegminal pads of the type of *nigra* are wider and its dorsal surface considerably less coarsely impresso-punctate than in the type of *rufipes*. The latero-caudal angles of the pronotum are nearly rectangulate in the former but narrower in the latter. The width of the pronotum is 11 in *nigra* and 10 in *rufipes*, that of the abdomen 12.5 in *nigra* and 11 mm. in *rufipes*. These differences we believe are due to individual variation and we therefore place *rufipes* as a synonym.

St. Lucia, British West Indies, VI, 1889, (G. A. Ramage), 1 ♀.

Becquia Island, Grenadines, British West Indies, (H. H. Smith), 1 ♀.

The very small brownish buff cerci have their minute acute apices blackish. These specimens are identical except for the larger size and darker limbs (deep maroon instead of light mahogany red) of the St. Lucia individual. Length of body 29.7 and 24.7, length of pronotum 8 and 6.7, greatest width of pronotum 10 and 9, exposed length of tegmen 3.7 and 3 mm.

Parasphaeria ovata (Blanchard)

Araucania, southern Chile, (R. M. Middleton), 1 ♀.

There is also a female of this remarkable species, taken on Ancud Chiloe Island, Chile, April 2 to 7, 1920, in the author's collection.

Hormetica pustulata new species (Pl. XIV, fig. 10.)

This insect is one of the smaller species of the genus. It is nearest the Venezuelan *H. verrucosa* Brunner, but is one of the most distinctive species we have ever described. From *verrucosa* it is easily separated by the decidedly smaller size, solidly black vertex, much smoother pronotum with pale markings more reduced, rounded triangular tegmina which are not attingent and have a decidedly more extensive dark marking, amazing pustulate specialization of dorsal surface of abdomen meso-caudad, which area is pale and paler limbs.

The insect has distinct arolia between the tarsal claws, this and to a less significant degree the spination of the ventral margins of the limbs, showing that it is not referable to *Parahormetica* Brunner.

Type.—♂; Bonaire Island, north coast of Venezuela. (From Simon Collection.) [British Museum.]

Size small for the genus; form broad, normal. Head broad, front flattened, polished, supplied with much scattered, shallow, impressed punctulae; interocular space very wide but slightly less wide than that between antennal sockets. Pronotum with cephalic and lateral margins cingulate but narrowly reflexed only laterad, cephalic very slightly less convex than lateral margins, which round sharply at very slightly over a rightangle into the almost transverse caudal margin; disk without elevations and with escutcheon normal in the genus weakly impressed meso-caudad and still more weakly so in its cephalic portion, the escutcheon indicated by weak, irregular but symmetrically placed ridges, surface with scattered impressed punctae, more numerous and distinct laterad. Tegmina separated by an interval (of 2 mm.), extending very slightly beyond caudal margin of metanotum, rounded trigonal, the sutural margin rounding very broadly to the broadly rounded apex at the costal margin; surface like pronotum but distad and toward costal margin with a network of slightly raised irregular veinlets, the mediastine field closely but shallowly and irregularly impressio-punctate. Wings rudimentary but extending as far as tegminal apices. Abdomen with latero-caudal angles of penultimate tergite alone slightly produced, rounded at an angle of ninety degrees; median portion of fourth, fifth and sixth tergites very thickly supplied with large glabrous pustules, the preceding tergite showing a tendency toward this condition. Supra-anal plate small, subchitinous, transverse and feebly bilobate, with a fine medio-longitudinal sulcation indicated. Cerci small, blunt conical, not twice as long as broad. Subgenital plate small, asymmetrically lobate as characteristic of the genus, styles missing. Limbs heavy but not as heavy as is normal in the genus. Ventral femoral margins armed as follows; cephalic of cephalic with (two and two) stout spines followed by a row of spiniform hairs and terminated with a single stout spine, caudal of cephalic with (one and two) stout spines distad, caudal of median (with two) and caudal of caudal with (two and three) stout spines distad, the fringe of hairs on the caudal of the median and caudal weak. Tarsi stout; caudal metatarsus distinctly longer than combined length of three succeeding joints, unarmed ventrad with very large pulvillus extending to near its base, three succeeding joints with large pulvilli. Arolium slightly over a third as long as a claw. Tarsal claws simple and symmetrical with basal thickening less decided than in *H. apolinari* Hebard.

Head, antennae and palpi blackish, a buffy suffusion in ocellar areas. Pronotum blackish with a band of buff extending from sides of head to near caudal margin within the cingulate lateral margins and a medio-longitudinal line of the same in cephalic portion of escutcheon. Mesonotum and metanotum blackish chestnut, meso-caudad the former is paler and meso-cephalad the latter is ochraceous tawny. Tegmina ochraceous tawny with a broad humeral band of blackish which becomes greatly diffused and mars brown as it curves to the median portion of the sutural margin. Abdomen dorsad blackish brown with a small submarginal buffy fleck proximo-laterad on each tergite; pustulate area ochraceous tawny, this narrowing and deepening cephalad to median segment, with supra-anal plate buckthorn brown. Cerci dark with pale tips. Ventral surface blackish brown, with free margins of subgenital plate buckthorn brown. Limbs russet; the femora, but particularly the coxae and tarsi, darker, deep mars brown.

Length of body 22.3, length of pronotum 7.8, greatest (caudal) width of pronotum 10.4, exposed length of tegmen 6.1, width of tegmen 5.7, greatest width of abdomen 12.3, length of caudal tibia 7, length of caudal tarsal joints 5.1 mm.

EXPLANATION OF PLATES

PLATE XIII

Fig. 1. *Cariblatta tobagensis* new species. Dorsal view of male pronotum. *Type*. Scarborough, Tobago. (X 10)

Fig. 2. *Cariblatta tobagensis* new species. Ventral view of male subgenital plate. *Type*. Scarborough, Tobago. (Much enlarged.)

Fig. 3. *Cariblatta spinicauda* new species. Dorsal View of male pronotum. *Type*. Windward side of St. Vincent, British West Indies. (X 10)

Fig. 4. *Cariblatta spinicauda* new species. Ventral view of male subgenital plate. *Type*. Windward side of St. Vincent, British West Indies. (Same scale as Fig. 2.)

Fig. 5. *Cariblatta punctipennis* Hebard. Ventral view of male subgenital plate. *Allotype*. Barbados, British West Indies. (Same scale as Fig. 2.)

Fig. 6. *Lophoblatta arawaka* new species. Ventral view of male subgenital plate. *Type*. Caparo, Trinidad. (Much enlarged.)

Fig. 7. *Lophoblatta arawaka* new species. Dorsal view of female pronotum. *Allotype*. Caparo, Trinidad. (X 7)

Fig. 8. *Lophoblatta pellucida* (Burmeister). Ventral view of male subgenital plate. *Topotype*. Igarapé-Assú, Pará, Brazil. (Same scale as Fig. 6.)

Fig. 9. *Neoblattella guianae* new species. Dorsal view of male pronotum. *Type*. Kartabo, British Guiana. (X 7)

Fig. 10. *Panchlora pulchella* Burmeister. Dorsal view of male tegmen. *Topotype*. Rio de Janeiro, Brazil. (X 2)

PLATE XIV

Fig. 1. *Pelmatosilpha lata* new species. Dorsal outline of male. *Type*. Kartabo, British Guiana. (X 1½)

Fig. 2. *Pelmatosilpha lata* new species. Dorsal outline of male supra-anal plate and cerci. *Type*. Kartabo, British Guiana. (X 5)

Fig. 3. *Epilampra sagitta* new species. Cephalic view of male head. *Type*. Teffe, Amazons, Brazil. (X 5)

Fig. 4. *Epilampra sagitta* new species. Dorsal view of male pronotum. *Type*. Teffe, Amazons, Brazil. (X 4)

Fig. 5. *Epilampra delicata* new species. Cephalic view of male head. *Type*. Tijuca, Rio de Janeiro, Brazil. (X 5)

Fig. 6. *Epilampra delicata* new species. Dorsal view of male pronotum. *Type*. Tijuca, Rio de Janeiro, Brazil. (X 4)

Fig. 7. *Phoraspis blanchardi* new species. Dorsal view of male pronotum. *Type*. Parana, Brazil. (X 4)

Fig. 8. *Chorisoneura nigrostriga* new species. Dorsal view of male. *Type*. Gorgona Island, Colombia. (X 5)

Fig. 9. *Chorisoneura colorata* new species. Dorsal view of male pronotum. *Type*. Gorgona Island, Colombia. (X 12)

Fig. 10. *Hormetica pustulata* new species. Dorsal view of male. *Type*. Bonaire Island, north coast of Venezuela. (X 2)

SUPPLEMENTARY NOTES ON PANAMANIAN DERMAPTERA AND ORTHOPTERA

BY MORGAN HEBARD

Over ten years ago we began the preparation of a series of papers on the Dermaptera and Orthoptera of Panama. Since publication on the first groups small additional series have been received, and it is the purpose of the present paper to publish those records and make a few corrections of our original comments. Two new species, an earwig and a cockroach, are here described.

DERMAPTERA

In our study of Panamanian Dermaptera[1], we were incorrect in stating that *Echinopsalis thoracica* (Serville) was the only species, recorded from Panama, which we did not have before us, noting there, however, the very questionable records of *Vostox similis, Sparatta nigrina* and *Ancistrogaster variegata.* One species was overlooked, *Diplatys servera* Bormans, described from the Volcan de Chiriqui, Panama, in the Biologia.

Parasparatta rehni new species (Pl. XV, figs. 1 and 2)

1914. *Sparatta nigrina* Burr (not of Stal, 1855), Canadian Ent., XLVI, p. 276. [♂, ♀; Porto Bello, Panama.]

The United States National Museum's material, determined by Burr as *nigrina,* has enabled us to make the above correction.

This insect is closely related to *P. dentifera* (Rehn) (see Pl. XV, fig. 3), described from Orizaba, Mexico. It may be readily distinguished by the ventro-internal flange of the forceps, in both sexes, terminated distad in an acute angle or tooth, instead of gradually tapering off. The female sex is further distinguished by having the broader, proximal ventro-internal flange of the forceps reduced to a large, acute-angulate, straight, flattened tooth, directed meso-distad and very weakly ventrad. In all other respects these species show great similarity.

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[1] Trans. Amer. Ent. Soc. XLIII, pp. 301 to 334, (1917).

Type.— ♀ ; Boquete, Chiriqui, Panama. August 15 to 20, 1922. (D. E. Harrower.) [Hebard Collection, Type no. 917.]

Size small, form slender, much as in *dentifera*. Head greatly depressed, conventional heart-shaped, sutures obsolete, caudal margin rather strongly concave. Eyes very small. Antennae with first joint over four times as long as broad, second joint quadrate, third nearly half as long as first, joints immediately succeeding increasing strongly in length distad. Pronotum as typical of genus; flattened, longer than broad; briefly produced cephalad to form a collar which is delimited by a delicate transverse sulcus, this produced area slightly more delicate than in *P. guyanensis* Hebard; lateral margins feebly convex and nearly parallel, caudal margin moderately convex. Tegmina and wings fully developed, thickly supplied with minutely microscopic hairs. Dorsal surface of abdomen similarly hairy except ultimate tergite which is largely smooth dorsad and has a U-shaped impressed line. Pygidium small, with dorsal surface convex and very strongly declivent, the distal (ventral) portion produced in a narrow lamella; ventral surface concave with lateral margins divergent caudad and caudal margin very broadly concave, the latero-caudal angles thus formed acute-angulate produced beneath the large proximo-internal lamellate teeth of the forceps much as in this sex of *dentifera*. Forceps microscopically hairy, almost straight but with a faint inward curvature becoming decided at the acute apices; internal margin produced in a flange immediately beyond pygidium, this forming a large, acute-angulate, straight, flattened tooth, directed meso-distad and very weakly ventrad, this margin thence again very gradually becoming more and more lamellate to near end of proximal two-thirds, thence of equal width to base of apex where it is suddenly terminated as a minute tooth, the margins of the flange microscopically serrulate. Caudal metatarsus as long as third tarsal joint, supplied with an external row of widely spaced minute spines and an internal very closely placed fringe of spiniform hairs.

Allotype.— ♂ ; Porto Bello, Panama. March 12, 1911. (E. A. Schwarz.) [United States National Museum.]

Very similar to female except pygidium and forceps, but very much smaller[2]. Pygidium much as in *dentifera* and *guyanensis*: a produced shaft, three times as long as basal width with dorsal surface convex transversely, the lateral margins weakly concave[3] so it is narrowest mesad (in distance to base of apex), the disto-lateral angles produced in acute points, the apex between these produced in a square median lamella. Forceps microscopically hairy, straight to the incurved, acute, flattened apices; internal surface concave proximad, a small conical tooth on ventral margin near end of proximal third, thence that margin becomes very gradually lamellate to apex where, just as in female, it is suddenly terminated in a minute tooth, margins of lamella smooth[4], a conical tooth slightly larger than the more proximal tooth just above this lamella at about end of proximal three-fifths of forceps.

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[2] Enormous individual size variation is shown by the Mexican series of *dentifera* before us and we are convinced that such also occurs in *rehni*.

[3] Similar in *guyanensis*, originally incorrectly given as convex.

Head, pronotum and abdomen except ultimate tergite very dark brown, the antennae and abdomen slightly darkest. Ultimate tergite tawny or buffy tinged with tawny, sometimes with caudal margin darker. Forceps and pygidium mars brown. Limbs light buckthorn brown in females, darker in male.

Length of body ♂ 4.5, ♀ 7.8; length of pronotum (not including neck) ♂ .66, ♀ 1.13; width of pronotum ♂ .55, ♀ .92; length of tegmen ♂ .64, ♀ 1.13; length of forceps ♂ 1.4, ♀ 2.7 mm.

Doru lineare (Eschscholtz)

Balboa, Canal Zone, Panama, 1912, (J. Zetek), 1 ♂.

Metresura ruficeps (Burmeister)

Boquete, Chiriqui, Panama, VIII, 15 to 20, 1922, (D. E. Harrower), 1 ♂, [A. N. S. P.].

Rehn has recently erected the genus *Metresura*[5], with the present species as genotype. It had previously been referred incorrectly to *Neolobophora*.

Rhyacolabis anachoreta Rehn

1922. *Rhyacolabis anachoreta* Rehn, Trans. Amer. Ent. Soc., XLVII, p. 313, pl. 17, figs. 2 and 3. [♀, juv.; Volcano of Irazu, Costa Rica.]

Boquete, Chirique, Panama, VIII, 15 to 20, 1922, (D. E. Harrower), 1 ♀, 2 large juv. ♂.

The immature males, when compared with immature males of *Metresura ruficeps* (Burmeister), are found to have very similar forceps, lacking a proximo-internal tooth and with external surface flattened proximad between a fine dorso-longitudinal and a similar ventro-longitudinal carina. In *anachoreta* these carinae are percurrent, but rounded beyond the proximal portion, in

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[4] These margins may well be serrulate in males as large as the female here described.

[5] Trans. Amer. Ent. Soc., XLVII, p. 31, (1922).

ruficeps they disappear, the external surface being, however, perfectly deplanate.

The male pygidium in this insect however, is rounded and feebly transverse with minute ventro-lateral points, in the immature condition of *ruficeps* already showing greater production with latero-caudal apices minutely denticulate and distal margin truncate between them.

Thus the present genus is seen to have closer agreement with *Metresura* in features of the male forceps, but with type of male pygidium nearest that developed in *Neolobophora*[6].

ORTHOPTERA

BLATTIDAE

ANAPLECTA Burmeister

In our description of this genus given in 1919 we stated "Cephalic femora with ventro-cephalic margin armed with a long row of closely-placed, short, microscopic, piliform spines, terminating in two elongate distal spines". This is incorrect, as in the genotype, *A. lateralis* Burmeister, and the great majority of the species which have been referred to *Anaplecta*, two (in some species three) elongate spines precede the series of piliform spines.

The genus is evidently polyphyletic and the new species described below belongs to one of the most distinctive groups, including the largest species.

In other groups showing minimum size and maximum reduction of limb spination, species from apparently the same stock have *(domestica)* or do not have *(alaris, cabimae, saussurei)* the heavy proximal spines of the ventro-cephalic margins of the cephalic femora.

Anaplecta guamina new species (Pl. XV, figs. 4 and 5.)

This handsome insect is one of the larger members of the genus. It is near *A. pulchella* Rehn, described from British Guiana[7], agreeing in the shining dark brown coloration and head markings but differing in the slightly larger size, striking coloration of first antennal joint and cerci and immaculate tegmina, which are evenly tinged with a slightly deeper shade of brown.

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[6] Comparison is made with two adult males of *Neolobophora bogotensis* Scudder, from Muzo, Boyacá, Colombia, which have been recorded by Rehn.

[7] Comparison is made with the type, a female; Hebard Collection, Type no. 509.

The male genitalic specialization in *guamina* is very distinctive. Wide differentiation in this feature will probably be found in the yet unknown male of *pulchella*.

Type.—♂; Guamina, Rio Chagres, Panama. March 5, 1921. (George H. H. Tate.) [Hebard Collection, Type no. 918.]

Size large and form broad for the genus. Head appreciably longer than broad; interocular space almost equal in width to that between antennal sockets, no distinct ridge above the latter; ocelli large. Pronotum with shallow but distinct impression present on disk latero-caudad; greatest width meso-caudad, lateral margins very evenly curved, this greatest caudad, cephalic and caudal margins showing very weak convexity, stronger in the latter. Tegmina of moderate width; costal margin very weakly convex but distad becoming very feebly concave before the rather broadly rounded apex (as compared with other species of the genus); costal veins numerous (twelve), a few proximad and mesad becoming obsolete before reaching the discoidal vein and a few of the spurious intervening veins in distal portion becoming as heavy as the costal veins toward the costal margin; four longitudinal discoidal sectors between which are (distad nearly as pronounced) intervening veins. Wings very ample, with (twelve) costal veins of which a number are very heavily clubbed distad, median vein with a single distal branch (toward costal margin) running to margin of appendicular field; cross-veinlets present between humeral, median, median branch and ulnar veins; appendicular field broader than long, anal vein paralleling fold in appendicular field and briefly separated from it. Dorsal surface of abdomen not specialized. Supra-anal plate large, dorsal surface proximad with two large concavities separated by a large long tuft of agglutinated hairs mesad, these areas flanked by broad rounded ridges convergent caudad; plate with a meso-distal deep emargination as figured. Subgenital plate with lateral margins oblique, very briefly sinistrad, more extensively dextrad, then suddenly concave, this more sudden and forming a broader socket sinistrad, the styles socketed at these points, between which the plate is produced with brief lateral margins straight convergent and very broad distal margin transverse, an acute straight styliform process at extremity of that margin directed caudad and reaching as far as the sinistral style. Styles elongate, smooth processes tapering to acute apices, the sinistral curved faintly sinistrad and longer than the straight dextral style. Cephalic femora with ventro-cephalic margin armed with (three) elongate spines, followed by an elongate row of minute spines, terminated in two elongote spines; caudal margin armed distad with (one or no) spines and a single apical spine. Other ventral femoral margins well supplied with elongate slender spines. Caudal metatarsus decidedly longer than combined length of succeeding joints, fourth joint alone furnished with a minute pulvillus which is produced filiform. Decidedly small arolia present between the simple, feebly asymmetrical tarsal claws.

Head chestnut brown with two large vague suffusions of buckthorn brown between the eyes, a moderately broad interocular band of buffy and a weak transverse suffusion of buffy between the lower portion of the antennal sockets. Palpi paler, verona brown. Antennae buffy deepening gradually to verona brown distad but with base of first joint verona brown. Ventral surface and limbs dresden brown, the ventral margins of the abdomen and dorsal surfaces of the tibiae blackish chestnut brown. Cerci ventrad with joints bister proximad and buffy distad, but third joint from apex wholly bister and all but distal margin of second joint from apex the same; dorsal surface similar but with brown only proximo-laterad to the two pre-apical much darker joints. Pronotum solidly blackish bay which includes disk, portion above head and all of caudal marginal portion, lateral portions transparent faintly tinged with brown. Tegmina transparent, uniformly and strongly tinged with sudan brown (a rich brown with a reddish orange tint). Wings tinged with buckthorn brown but tinged with amber brown in enlarged portion of costal veins and all of marginal field distad, and paler, tinged with mars yellow very broadly before appendicular field in radiate field and weakly so tinged in appendicular field with traces of such around free margin of radiate field.

Length of body 8.7, length of pronotum 2, width of pronotum 3, length of tegmen 9.4, width of tegmen 2.9, length of appendicular field of wing 2.5, width of same 2.8 mm.

Neoblattella acanthastylata Hebard

Guamina, Rio Chagres, Panama, III, 5, 1922, (G. H. H. Tate), 2♂, 1♀.

The present adults, in excellent condition, have the ground coloration of the pronotal disk light ochraceous-buff without any of the weakly tawny tinge such as is usual in such related species as *N. fratercula* and *N. impar*.

Neoblattella impar Hebard

Gatun, Canal Zone, Panama, IX, 1 to 7, 1922, (D. E. Harrower), 1 ♂, 1 ♀, 1 juv.

Neoblattella nahua (Saussure and Zehntner)

Guamina, Rio Chagres, Panama, III, 5, 1922, (G. H. H. Tate), 1 ♀.

Neoblattella fraterna (Saussure and Zehntner)

Panama City, Panama, 1916, (J. Zetek), 1 ♀.

Blattella germanica (Linnaeus)

Mouth of Rio Nargana, Gulf of San Blas, Panama, VII, 1922, (D. E. Harrower), 2 ♀.

Supella supellectilium (Serville)

Colon, Panama, 1913, (J. Zetek), ♂.

Ischnoptera rufa rufa (De Geer)

Mouth of Rio Nargana, Gulf of San Blas, Panama, VII, 1922, (D. E. Harrower), 1 ♂, [A. N. S. P.].

Balboa, Canal Zone, Panama, 1913, (J. Zetek), 2 ♂.

Ischnoptera rufa occidentalis Saussure

Panama City, Panama, 1912, (J. Zetek), 1 ♂.

This specimen, unlike all previous individuals of this race received from Panama, is small and plainly colored. It would seem very probable that it came from a colony, introduced by commerce in Panama City and not belonging to the native strain.

Ischnoptera panamae Hebard

Guamina, Rio Chagres, Panama, III, 5, 1922, (G. H. H. Tate), 1 ♂.

Balboa, Canal Zone, Panama, 1912, (J. Zetek), 1 ♀.

Xestoblatta festae (Griffini)

Panama City, Panama, 1911, (J. Zetek), 1 ♀.

The interocular space is narrower in this female than in the two other Panamanian females before us.

Euphyllodromia angustata (Latreille)

Guamina, Rio Chagres, Panama, III, 5, 1922, (G. H. H. Tate), 2 ♂, 1 ♀.

Balboa, Canal Zone, Panama, 1916, (J. Zetek), 1 ♀.

Euphyllodromia decastigmata Hebard

Gatun, Canal Zone, Panama, IX, 1 to 7, 1922, (D. E. Harrower), 1 ♂.

Eurycotis biolleyi Rehn

Panama City, Panama, 1912, (J. Zetek), 1 ♂, 1 ♀.

Boquete, Chiriqui, Panama, VIII, 15 to 20, 1922, (D. E. Harrower), 1 ♂, 2 ♀.

Periplaneta americana (Linnaeus)

Panama City, Panama, 1912, (J. Zetek), 1 ♀.

Periplaneta brunnea Burmeister

Panama City, Panama, 1912, (J. Zetek), 1 ♂.

Epilampra azteca Saussure

Ancon, Canal Zone, Panama, 1914, (J. Zetek), 1 ♀.

Panama City, Panama, 1914, (J. Zetek), 6 ♂.

Epilampra abdomen-nigrum (De Geer)

Gatun, Canal Zone, Panama, IX, 1 to 7, 1922, (D. E. Harrower), 1 juv. ♂.

This insect appears in our "Blattidae of Panama" as *E. maya* Rehn, which name has since been placed in the present synonymy by the original author.

Epilampra colombiana Saussure

Ancon, Canal Zone, Panama, 1911, (J. Zetek), 1 ♂.

This individual represents a depauperate and decidedly recessive phase.

Pycnoscelus surinamensis (Linnaeus)

Ancon, Canal Zone, Panama, V, 31, 1913, (J. Zetek), 1 ♀.

Panchlora cubensis Saussure

Corozal, Canal Zone, Panama, 1912, (J. Zetek), 2 ♂, 2 ♀.

Archimandrita tessellata Rehn

Panama City, Panama, (J. Zetek), 1 ♀.

Eublabrus biolleyi (Rehn)

Guamina, Rio Chagres, Panama, III, 5, 1922, (G. H. H. Tate), 1 ♀.

The markings of this handsome specimen agree closely with those of the type.

Compsodes cucullatus (Saussure and Zehntner)

Boquete, Chiriqui, Panama, VIII, 15 to 20, 1922, (D. H. Harrower), 2 ♀.

The female of this species has not been previously recorded. Comparing the sexes of *C. delicatulus* (Saussure and Zehntner) we find a similar contrast between the sexes in the present case, The females of *cucullatus* may be distinguished from those of *delicatulus* by their larger size, broader form, pronotum which, at the lateral margins, shows slightly greater concavity of its dorsal surface and uniform deep prouts brown coloration of the dorsal surface.

The labrum, proximal portions of the limbs, all but the latero-distal portions of ventral surface of abdomen and median portion of the subgenital plate are much paler, buffy brown.

The measurements are as follows: length of body 4.8 and 4.85, greatest width of body 2.8 and 2.9 mm.

NICUESA new genus

This genus is proposed to include a single, remarkably barred, new species, *N. dichroa*. It is nearest *Caloblatta* Saussure[8], differing in being larger; generally glabrous instead of velutinous; antennae less but pronotum and tegmina more setaceous; the vertex to between the ocelli glabrous with large scattered impressions instead of shagreenous and with rugae and large impressions; the tegmina transparent instead of translucent with finer venation and discoidal sectors almost longitudinal, very feebly oblique; the wings hyaline and not iridescent with median and ulnar veins even more distinctly curved.

These genera agree in having large ocellar spots with flat surfaces forming a decided angle with plane of the inter-ocular-occipital area; sides of face converging ventrad; palpi rather short; pronotum broader than long with caudal margin very broadly convex and latero-caudal sulci of disk shallow but broad and distinct; tegmina and wings fully developed in both sexes; tegmina with anal field elongate; wings with narrow costal field and costal veins slightly thickened to near bases, medio-discoidal area broad with numerous transverse veins, moderately well developed intercalated triangle, ulnar vein branching distad and with (a few to one) incomplete branches preceding; cephalic femora with ventro-cephalic margin armed with heavy spines followed by a row of minute spines and terminating in two elongate distal spines; other ventral femoral margins armed with a very few widely placed small spines; caudal metatarsus elongate, it and the three succeeding joints each with a small distal pulvillus; small arolium present between the simple, symmetrical tarsal claws; female subgenital plate simple; male subgenital plate (known only for *Caloblatta lampra* Hebard) asymmetrical, Ischnopteroid.

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[8] See Soc. Ent., p. 57, (1893) and Hebard, Trans. Amer. Ent. Soc., XLVIII, p. 178, (1923).

Nicuesa dichroa new species (Pl. XV, fig. 6.)

The broad, transverse, buff and blackish brown bars give this insect a very different general appearance from that of any other Panamanian cockroach.

Type.— ♀ ; Barro Colorado Island, Gatun Lake, Canal Zone, Panama. April 6. 1924. (J. C. Bradley.) [Hebard Collection, Type no. 1160.]

Size large when compared with the species of *Caloblatta;* form similar, moderately slender. Head with width between antennal sockets very slightly greater than that between eyes. Palpi with third joint about two-thirds as long as the enlarged fifth joint, fourth about two-thirds as long as third. Antennae moderately setaceous throughout. Pronotum with latero-caudal angles broadly and latero-cephalic angles extremely broadly rounded. Tegmina very delicate, moderately setaceous in all but portion of dextral tegmen concealed when at rest; veinlets between discoidal sectors very faintly indicated. Wings ample, extremely delicate. Supra-anal plate triangularly produced, lateral margins broadly concave to the sharply rounded apex. Subgenital plate ample, with free margin broadly convex. Femora with ventral margins (except ventro-cephalic of cephalic) armed with one to three spines.

Head, antennae to near apices (where they become buffy), broad cephalic and narrower caudal portion of pronotum, base of tegmina (including proximal two-thirds of anal field), all femora, three distal abdominal tergites and cerci shining blackish chestnut brown. The tegmina with this portion translucent and large distal portion (above dark abdominal tergites) slightly paler (paling to apices) transparent chestnut brown. Ocellar spots, coxae, trochanters, proximal portion of abdomen and median transparent portion of tegmina light ochraceous buff. Large transverse median portion of pronotum clear ochraceous buff. Wings almost colorless with veins very light ochraceous buff. Supra-anal plate, all but base of subgenital plate, tibiae and tarsi ochraceous tawny.

Length of body 12, length of pronotum 3.8, width of pronotum 4.1, length of tegmen 13, width of tegmen 3.7, length of caudal tibia 5 mm.

Litopeltis bispinosus (Saussure)

Panama City, Panama, 1914, (J. Zetek), 3 ♂.

MANTIDAE

Mantoida maya (Saussure and Zehntner)

Old Panama, Panama, I, 31, 1911, (E. A. Schwarz), 1 juv.

Liturgousa cayennensis Saussure

Mouth of Rio Nargana, Gulf of San Blas, Panama, VII, 1922, (D. E. Harrower), 1 juv.

PHASMIDAE

Stratocles multilineatus Rehn

Guamina, Rio Chagres, Panama, III, 5, 1922, (G. H. H. Tate), 1 ♀.

EXPLANATION OF PLATE XV

Fig. 1. *Parasparatta rehni* new species. Male. *Allotype.* Dorsal view of pygidium and forceps. (X 26)

Fig. 2. *Parasparatta rehni* new species. Female. *Type.* Dorsal view of pygidium and forceps. (X 13)

Fig. 3. *Parasparatta dentifera* (Rehn). Female. *Type.* Orizaba, Vera Cruz, Mexico. Dorsal view of pygidium and forceps. (X 13)

Fig. 4. *Anaplecta guamina* new species. Male. *Type.* Guamina, Rio Chagres, Panama. Dorsal view of supra anal plate showing high specialization and agglutinated hairs meso-proximad. (Greatly enlarged.)

Fig. 5. *Anaplecta guamina* new species. Male. *Type.* Guamina, Rio Chagres, Panama. Ventral view of subgenital plate. (Greatly enlarged.)

Fig. 6. *Nicuesa dichroa* new genus and species. Female. *Type.* Barro Colorado Island, Gatun Lake, Panama. Dorsal view. (X 5)

A REVISION OF THE NORTH AMERICAN SPECIES OF FRUIT FLIES OF THE GENUS RHAGOLETIS

(DIPTERA: TRYPETIDAE)

BY EZRA T. CRESSON, JR.

The present paper is the result of a study of this genus occasioned by the receipt of three species for determination which were found to infest the Persian Walnuts in California and Arizona. As the members of this genus are of economic importance, affecting cultivated fruits, and as there seems to be some uncertainty as to the status of several of the species, it occurred to the writer that a brief review of the North American species constituting the genus, with short descriptions and good illustrations of the wing patterns, would prove a useful contribution to our knowledge of this interesting family of fruit flies, the Trypetidae.

The species, so far as known, are injurious to, or in their larval stage live in the fruits of the apple, cherry, currant, gooseberry, hawthorn, pear, plum, huckleberry, blueberry, snowberry, juniper, and walnut. Some have proved to be serious pests. It was quite recently (1902), that the black walnut was found to be the host of a species of this genus, and several years ago (1920), the writer described a species which were found infesting the Persian Walnuts in Arizona. The two new species herein described add two more pests of this fruit.

In this, as in other genera of the Trypetidae, we probably have species which are not confined in their attack to one kind of fruit, but may adopt an entirely different kind, in one locality, from that in another although both kinds may be present. This difference in the nature of its food supply may reasonably be expected to exert some influence on the larva, resulting in some changes in the structural characters or color pattern of the adult. The Apple Maggot, *pomonella,* is probably such a species, attacking the apple in one locality and the snowberry in another; and in *tabernella* we have normally a cherry pest, but which is found attacking the juniper berries. I have been unable to find any tangible characters by which the snowberry individuals can be separated from those bred from apples, nor the juniper pest from the cherry fruit fly.

The adults are rarely seen on the wing, and probably only by rearing can good series of the species be secured. In this, however, considerable effort is necessary to collect fruit which is infested, and carrying the larvae and pupae through the subsequent stages to maturity.

The species are very scarce in collections. No collection, to my knowledge has all the species represented, and very few specimens of those present. Fortunately I have been able to secure specimens of all the described North American species from the several institutions below mentioned. The writer, is therefore, greatly indebted to the United States National Museum through Dr. J. M. Aldrich, to Cornell University, through Prof. O. A. Johannsen, and to the Museum of Comparative Zoology, through Mr. Nathan Banks, for their generous loans of specimens, in some cases type and cotypic material of species not here in the Philadelphia collection. The drawings were made by Miss Helen Winchester. In the lists of the specimens examined the ownership of the same is indicated within brackets [ ]. If not so indicated, the specimens are in the collection of the Academy of Natural Sciences of Philadelphia, in which collection are the types of the new species described.

RHAGOLETIS Loew

1862. *Rhagoletis* Loew, Eur. Bohrfl., p. 44. [Monotypic; *Musca cerasi* Linn.].

1898. *Rhagoletis* Doane, Ent. News, IX, p. 69. [key to North American species].

1909. *Rhagoletis* Aldrich, Can. Ent., XLI, p. 69. [key to North American species].

1910. *Rhagoletis* Bezzi, Bol. Lab. Zool. Portici, V, p. 12. [key to species and bibliography].

1923. *Rhagoletis* Phillips, Jour. N. Y. Ent. Soc., XXXI, p. 134. [key to N. E. United States species].

Species have been described as belonging to this genus from Europe (three, not including recognized synonyms), North America (fourteen, including possible synonyms), Mexico and South America (seven), and Japan (one). It is quite certain that all these species are not members, and the following North American species, occurring north of Mexico, have been excluded: *Rhagoletis caurina* Doane (1899), *R. formosa* Coquillett (1894), *R. grindeliae* Coquillett (1907), (which three Dr. Aldrich considers congeneric but not members of *Rhagoletis*) and *Zonosema dubia* Johnson (1903). This latter species, the type of which is before me, has some aspects of *Rhagoletis,* but the wing pattern is considerably broken up, the third antennal segment is rounded apically, and the dorsocentrals are distinctly behind the line of the supraalars.

Those North American species which are considered typical members, have certain characteristics in common which I will describe as follows, not always repeating the same in the descriptions of the species themselves:

Description.—Black or yellowish, with head, notopleural stripe, scutellum, tibiae, and tarsi, pale; abdomen often banded with same color at apices of the segments.

Head hemispherical with facial profile vertical or epistoma retreating. Frons longer than broad; ocellar bristles well developed; two reclinate frontals, three proclinate fronto-orbitals; postorbital bristles normal but often pale. Third antennal segment submucronate apically; arista with short pubescence. Proboscis short. Dorsocentral pair aligned with supraalars; humeral, presutural, postalar, prescutellars, one or two mesopleurals, pteropleural and sternopleural bristles well developed; four scutellars. Ovipositor flattened. Wings with apex of anal cell distinctly pointed and triangularly produced; anterior crossvein about middle of discal cell; posterior crossvein straight and transverse. First vein setulose above. The infuscated pattern consists, primarily of three more or less transverse bands and an extension along the apical costal margin. These may be termed: subbasal, proximomedian, distomedian, and apical costal bands.

There is considerable variation in the amount of separation and coalescing of these bands. In *pomonella* we have the complete coalescing of the two median bands and in *juglandis* the complete separation of all but the apical costal bands, which latter, in all the known species treated, is always connected with the distomedian band at the costa.

As the drawings of the wing patterns will serve to identify the species, I will not give a key. The descriptions should supply the additional characters.

Group cerasi

Median hyaline band or costal area present; apical costal margin infuscated.

The species of this group as far as known are miners of drupaceous fruits, and includes the cherry fruit maggot of Europe, *Rhagoletis cerasi* (Linn.), (Pl. XVI, fig. 1).

Rhagoletis fausta (Osten-Sacken) (Pl. XVI, fig. 2.)

1877. *Trypeta* (*Acidia*) *fausta* Osten-Sacken, Bull. U. S. Geol. & Geog., Surv., III, p. 346. [♂, ♀; Mt. Washington, N. H.].
1878. *Trypeta* (*Acidia*) *fausta* Osten-Sacken, Cat. Dipt. N. A., p. 189.
1899. *Rhagoletis fausta* Coquillett, Jour. N. Y. Ent. Soc., VII, p. 260. [Note].
1905. *Acidia fausta* Aldrich, Cat. N. A. Dipt., p. 603. [Montreal].
1907. *Rhagoletis cingulata* Fletcher, Rep. Ent. & Bot. Canada, 1901, p. 228. [Br. Col.; as *R. cingulata*].
1909. *Rhagoletis fausta* Aldrich, Can. Ent., XLI, p. 70. [in key].
1909. *Rhagoletis intrudens* Aldrich, Can. Ent., XLI, p. 70, pl. 4, fig. 3. [♀; Victoria, Br. Col.].
1910. *Rhagoletis fausta* Aldrich, Can. Ent., XLII, p. 99. [*Syn. R. intrudens* Ald.; Ontario].
1910. *Rhagoletis fausta* Bezzi, Bol. Lab. Zool. Agr. Portici, V, p. 17. [note and key].
1911. *Rhagoletis fausta* Hewitt, Rep. Exp. Farms, Can., 1911, p. 230.
1912. *Rhagoletis fausta* Illingworth, Bull. Cornell Agr. Sta., no. 325, p. 191, ill. [biology, bibliography].
1915. *Rhagoletis fausta* Caesar, Rep. Ent. Soc. Ont., XLV, p. 107, fig. 22. [Canada; Biol.].
1923. *Rhagoletis fausta* Phillips, Jour. N. Y. Ent. Soc., XXXI, p. 136, pl. 28, fig. 26. [N. Y.].
1925. *Rhagoletis fausta* Johnson, Oc. Pap. Bost. Soc. Nat. Hist., VII, p. 263. [Maine, Mass.].

Synonymy.—The synonymy of *R. intrudens* Aldrich, was established by Aldrich (1910) and there is no question as to the correctness of this treatment.

Diagnosis.—Black, including the occiput and femora; notopleural stripe and scutellum as usual, yellow, but no pale apices to abdominal segments. The median costal hyaline area of the wings is triangular in outline (Fig. 2), not crossing the fourth vein. There is an isolated hyaline spot in apical portion of discal cell which may sometimes be connected with a similar spot in third posterior cell. The oblique infuscated band crossing the apical portion of first posterior cell is characteristic.

Distribution.—A widely distributed species infesting the cherry fruit, ranging "across the continent from New Hampshire to the Pacific Coast, favoring the northern latitudes and the high altitudes.[1] As very full descriptions of all stages, and other data will be found in Illingworth's bulletin, I will not review his work here. Johnson (1925) in his List of the Diptera of New England, records this species from Maine and Massachusetts. I have examined the following:

1 ♂, 1 ♀; St. Catharines, Ontario, Canada, June 23, and July 5, 1912, (Caesar in cherries), [U. S. N. M.].

1 ♀; "Cornell U. Lot 400, Sub. 3", [Cornell].

Rhagoletis striatella van der Wulp (Pl. XVI, fig. 3.)

1899. *Rhagoletis striatella* van der Wulp, Biol. Cent.-Am., Dipt., II, p. 408, pl. 11, fig. 30. [♀; Amula, Guerrero, Mexico].

1923. *Rhagoletis striatella* Phillips, Jour. N. Y. Ent. Soc., XXXI, p. 136, pl. 18, fig. 27. [Illinois].

This species may be compared as regards wing pattern with *fausta* as *completa* is with *suavis*. That is, the median hyaline costal indentation of *fausta* continues to at least the fifth vein in *striatella*, but there is considerable difference in the inclination of the infuscated fingers emitted from the distomedian band into the second posterior cell, they being more transverse in *fausta*, more oblique in *striatella*. I think we have however a distinct species in *striatella*.

Diagnosis.—Black species. Second to sixth abdominal segments yellow-white; fore femora, apices of middle and hind femora, all tibiae and tarsi, tawny. Mesonotum with two broad,

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[1] Illingworth, 1912, p. 195.

median cinereous stripes with a suggestion of a fine line in the dorsocentral regions. Head higher than broad; cheeks more than twice as broad as third antennal segment; face twice as long as broad. Wings as figured (Fig. 3).

Distribution.—This species was described from the state of Guerrero, in the southern part of Mexico, but the female before me from Las Vegas, New Mexico, 19.8.07, (H. S. Barber), [U. S. N. M.], agrees with the original description. The species probably infests drupaceous fruits occurring in Mexico and Southwestern United States. The species has been reported from Illinois by Phillips (1923) upon a specimen in the collection of Mr. C. W. Johnson, which, however, she did not see. This specimen, a female, was kindly loaned me by Mr. Nathan Banks. It has some tawny or yellow marks on the first, second, fourth and fifth abdominal segments, particularly margining the bases of the white bands; the ovipositor segment is more than twice as long as broad, and connical, not flattened.

Group tabellaria

Median hyaline band or costal area, present; apical costal margin of wing hyaline, but tips of third and fourth veins often infuscated.

The species of this group infest various fruits, and include the well known American Cherry Fruit-Fly.

Rhagoletis tabellaria (Fitch) (Pl. XVI, figs. 4 and 5.)

1856. *Tephritis tabellaria* Fitch, Rep. Nox. & Benef. Ins. N. Y., i, p. 66. [New York; ?injurious to the cherry].

1873. *Trypeta* (*Rhagoletis*) *tabellaria* Loew, Mon. Dipt. N. A., iii, p. 263. [♀; Canada].

1898. *Rhagoletis tabellaria* Doane, Ent. News, ix, p. 69. [in key].

1898. *Rhagoletis ribicola* Doane, Ent. News, ix, p. 69, pl. 4. [♂, ♀; Washington and Idaho; infesting currant and gooseberry].

1899. *Rhagoletis ribicola* Doane, Jour. N. Y. Ent. Soc., vii, p. 181, pl. 3, fig. 4.

1900. *Rhagoletis tabellaria* Smith, Ins. N. Jersey, p. 687. [New Jersey].

1909. *Rhagoletis ribicola* Aldrich, Can. Ent., xli, p. 69, fig. 1. [in key; habitat note].

1909. *Rhagoletis tabellaria* Aldrich, Can. Ent., xli, p. 69. [in key].

1915. *Rhagoletis juniperinus* Marcovitch, An. Ent. Soc. Am., viii, p. 171, pl. 13, figs. 3-7. [♂, ♀; New York; infesting juniper berry].

1923. *Rhagoletis tabellaria* Phillips, Jour. N. Y. Ent. Soc., XXXI, p. 135, pl. 18, fig. 21. [in key; infesting blueberry in Nebraska and Washington].

1923. *Rhagoletis juniperinus* Phillips, Jour. N. Y. Ent. Soc., XXXI, p. 135, pl. 18, fig. 19.

1925. *Rhagoletis tabellaria* Johnson, Occ. Pap. Bost. Soc. Nat. Hist., VII, p. 211. [Maine].

Synonymy.—The paratypes or "cotypes" I have examined of *R. ribicola* convinces me that it is a variety in which the first and second infuscated bands of the wings are not connected in the axillary lobe (Fig. 5). The femora in these specimens are yellow, concolorous with the tibiae. I do not think it merits recognition under a separate name. Large series from different localities will probably show considerable variation in these characters.

The examination of the type of *R. juniperinus* reveals no character of specific importance.

Diagnosis.—A black species in which the femora may be entirely yellow *(ribicola)*. The wings (Fig. 4) have the apical costal area narrowly hyaline; the median hyaline band complete across the wing; the proximomedian and subbasal infuscated bands may or may not be connected below fifth vein. The abdomen black with apical cinereous margins on second to fourth segments.

Distribution.—Dr. Fitch described this species from specimens found on a cherry tree, but not observed attacking the fruit. Loew (1873) records it from Canada, and as *ribicola* Doane described it from Washington and Idaho, infesting the cultivated currant and gooseberry, later stating (1899) that it was "destructive throughout the state" [?Washington]. Dr. Aldrich (1909) records it as *ribicola* on the wild gooseberry at Polloch, Idaho. Under *juniperinus*, Marcovitch described it as a new species infesting the juniper berry at Six-Mile Creek, Ithaca, New York. Mrs. Phillips (1923) records it infesting the blueberry in Nebraska and Washington. I have the following material:

One ♂; labeled "Wash. Exp. Sta. No. 020." "Cotype No. 42213, U. S. N. M." "Rhagoletis ribicola Doane. Type". [U. S. N. M.].

One specimen (abdomen missing); labeled, "Wash. Exp. Sta., No. 120" "Type Cornell Univ. No. 505" "Rhagoletis ribicola Doane". [Cornell].

One ♂; Colfax, Washington, July 10, 1895. [Cornell].

Rhagoletis cingulata (Loew) (Pl. XVI, fig. 6.)

1862. *Trypeta cingulata* Loew, Mon. Dipt. N. A., I, p. 76, pl. 2, fig. 11. [♀; Middle States].
1873. *Rhagoletis cingulata* Loew, Mon. Dipt. N. A., III, p. 329.
1899. *Rhagoletis cingulata* Slingerland, Bull. Cornell Agr. Exp. Sta., no. 172, 41 pp., ill. [New York; biology; infesting cherry fruit].
1900. *Rhogoletis cingulata* Smith, Ins. N. J., p. 687. [New Jersey].
1909. *Rhagoletis cingulata* Aldrich, Can. Ent., XLI, p. 69, fig. 2. [?Mass.].
1912. *Rhagoletis cingulata* Illingworth, Bull. Cornell Agr. Exp. Sta., no. 325, p. 191, ill.
1914. *Rhagoletis cingulata* Chittenden, Bull. U. S. Bur. Ent., no. 44, p. 70, ill. [Biology].
1915. *Rhagoletis cingulata* Caesar, An. Rep. Ent. Soc. Ont., XLV, p. 107, fig. 23. [Canada].
1923. *Rhagoletis cingulata* Phillips, Jour. N. Y. Ent. Soc., XXXI, p. 135, pl. 18, fig. 22. [N. Y.].
1925. *Rhagoletis cingulata* Johnson, Occ. Pap. Bost. Soc. Nat. Hist., VII, p. 261. [Maine].

This is one of our common cherry fruit flies. Chittenden (1914) describes its life history and gives a very full account of this pest. It is easily distinguished by the apparent bending of the apical costal band leaving a spot of brown at the tip of the third vein.

Diagnosis.—Black species. Apices of second to fifth abdominal segments and legs including coxae, yellow. Wings as figured (Fig. 6). There probably will be found some variation in the color of the legs. The infuscated spot at tip of third vein is characteristic of this species; it seems to be always present.

Distribution.—The species was described from "Middle States". It has been recorded from New York (Slingerland), New Jersey (Aldrich), Massachusetts, District of Columbia, Michigan, Pennsylvania (Chittenden). I have seen the following specimens:

One ♂; Philadelphia, July 2, 1903.
One ♀; Roxboro, Pennsylvania, June 25, 1913.

Group pomonella

The single North American species of this group is not typical in that its wing pattern has no costal hyaline indentation in the marginal cell. The apical costal margin is hyaline.

This group contains the well known Apple Maggot.

Rhagoletis pomonella (Walsh) (Pl. XVI, fig. 7.)

1868. *Trypeta pomonella* Walsh, Rep. Nox. Ins. Ill., I, p. 29, fig. 2. [♂, ♀; Illinois; infesting fruit of apples and haws].

1873. *Rhagoletis pomonella* Loew, Mon. Dip. N. Am., III, p. 329.

1894. *Rhagoletis zephyria* Snow, Kans. Univ. Quart., II, p. 164, pl. 6, fig. 1. [♂; Southern California].

1894. *Rhagoletis pomonella* Snow, Kans. Univ. Quart., II, p. 164, pl. 6, fig. 3.

1898. *Rhagoletis pomonella* Doane, Ent. News, IX, p. 69. [syn. *R. zephyria* Snow].

1909. *Rhagoletis pomonella* Aldrich, Can. Ent., XLI, p. 69, fig. 4. [Distribution and synonymy].

1915. *Rhagoletis pomonella* Good, Proc. Ent. Soc. Nov. Scotia, I, p. 54. [Nova Scotia].

1917. *Rhagoletis pomonella* Treherne, Can. Ent., XLIX, p. 329. [British Columbia].

1923. *Rhagoletis pomonella* Phillips, Jour. N. Y. Ent. Soc., XXXI, p. 136, pl. 18, fig. 25. [Injurious to cranberries].

1924. *Rhagoletis pomonella* Curran, Can. Ent., LVI, p. 63. [Description of genitalia].

1924. *Rhagoletis symphoricarpi* Curran, Can. Ent., LVI, p. 63. [♂, ♀; British Columbia].

1924. *Rhagoletis zephyria* Curran, Can. Ent., LVI, p. 63. [Description of female characters].

1924. *Rhagoletis pomonella* Snodgrass, U. S. Jour. Agr. Res., XXVIII, p. 1-36, ill. [Anatomy].

1924. *Rhagoletis zephyria* Curran, An. Rep. Ent. Soc. Ont., LIV, p. 57. [Maintains specific identity].

1924. *Rhagoletis symphoricarpi* Curran, An. Rep. Ent. Soc. Ont., LIV, p. 57, fig. 1. [Maintains specific identity].

1925. *Rhagoletis pomonella* Johnson, Occ. Pap. Bost. Soc. Nat. Hist., VII, p. 261. [Maine; Massachusetts].

1928. *Rhagoletis pomonella* Porter, U. S. Dept. Agr., Tech. Bull. no. 66, 48 pp., ill. [Biology, Bibliography, Distribution].

This species is unique in having no hyaline costal areas between the first and second veins (Fig. 7). It seems that the proximo- and disto-median infuscated bands have entirely coalesced. By this character alone the species may be distinguished from all others of the genus. There is considerable variation in the color of the legs, in the extent of the paler markings of the body, and in the intensity of the wing pattern. Some of this may be due to the influence of the various hosts.

The species infests a considerable variety of fruits. Its known hosts include the apple, plum, blueberry, cranberry, snowberry, and fruit of the genus Crataegus. It is noteworthy that the apple is not attacked by this fly in the western states where it does infest the wild snowberry.

I have not attempted to give a full bibliography of this species. Many other references may be secured from Colcord's Index and Experiment Station Reports and Bulletins.

Synonymy.—The synonym of *zephyria* is considered on the authority of Doane (1898) and others. I have not seen this form from Southern California and as this locality is very remote from the known general area of distribution of *pomonella* it may prove to be, at least a good subspecies. It was described from three males. Curran (1924) states that he has examined the type of *zephyria,* but could not find any tangible characters by which the males may be distinguished from those of *pomonella.* He does, however, mention some characteristics by which the females can be separated although he does not state that his specimens were topotypes, and as these they may not be conspecific with the three typical males, or with the male type, his conclusions are not convincing.

The synonymy of *symphoricarpi* is of the present making. The slight differences mentioned by Curran (1924) seem to be possibly due to the different nature of the host, the snowberry. I have seen specimens determined as *symphoricarpi* reared from the snowberry in Oregon and can see nothing to merit its distinction.

Distribution.—The known range of this species is: Nova Scotia westwards to North Dakota, southwards to Maryland, and to Georgia in the Tansitional Life Zone of the Appalachian Mountains, and to the Ohio River to Northern Arkansas. It also occurs in Oregon and Western Canada, and probably California. I have seen the following specimens:

One ♀ ; Woods Hole, Massachusetts, July 24, (Johnson).

One ♀ ; Carbonate, Columbia River, British Columbia, July 7 to 12, 1908, 2800 feet alt., (Bradley), [Cornell].

One ♂ ; Corvallis, Oregon, (reared from snowberry, det. "symphoricarpi"), [U. S. N. M.].

Group suavis

Median hyaline costal area or band present. Apical costal margin of wing infuscated.

This group include the species infesting the exocarp of walnut.

Rhagoletis suavis (Loew) (Pl. XVI, fig. 8.)

1862. *Trypeta suavis* Loew, Mon. Dipt. N. Am., I, p. 175, pl. 2, fig. 10. [♂; Middle States].

1873. *Trypeta* (*Acidia*) *suavis* Loew, Mon. Dipt. N. Am., III, p. 235, pl. 10, fig. 10.

1873. *Acidia suavis* Loew, Mon. Dipt. N. Am., III, p. 329.

1899. *Rhagoletis suavis* Coquillett, Jour. N. Y. Ent. Soc., VII, p. 260.

1902. *Rhagoletis suavis* Babb, Ent. News, XII, p. 242, pl. 1. [Biology; infesting black walnuts in Massachusetts].

1905. *Acidia suavis* Aldrich, Cat. N. Am. Dipt. p. 603.

1909. *Rhagoletis suavis* Aldrich, Can. Ent., XLI, p. 69. [in key].

1910. *Rhagoletis suavis* Bezzi, Boll. Lab. Zool. Agr. Portici, V, p. 16. [in key, and note].

1923. *Rhagoletis suavis* Phillips, Jour. N. Y. Ent. Soc., XXXI, p. 136, pl. 18, fig. 24. [Maryland, New York].

This is the largest species in the genus and may be diagnosed as follows:

Body color tawny to ferruginous. Scutellum, apices of second to fourth abdominal segments, and legs paler, yellow. Bases of entire fifth abdominal segment of males somewhat darker. Wings marked as figured (Fig. 8) with the veins in the hyaline areas towards the costa whitish, in the other parts, brown. The median hyaline triangle does not extend beyond the fourth vein, but the hyaline spot in the apex of third posterior cell sometimes extends into the discal cell. Length, 5 to 6 mm.

Distribution.—This species was described from a male from "Middle States" and has since been reported from Massachusetts by Babb (1902) who found the larvae "in the pulpy coverings of the fruit of the black walnut, *Juglans nigra*". He describes and figures the larva and pupa from which he reared adults of this species. Mrs. Phillips records the species from Maryland and New York, and it will probably be found to range conformably with that of its host in the Eastern United States, and represented by subspecies in other species of walnuts, particularly in other localities. I have seen specimens from the following localities:

One ♂; Ithaca, New York, August 5, 1891.
One ♂; Lake Mahopac, August 31, 1903, (T. D. O'Connor).
One ♂; Illinois, (Dr. Lewis).

The specimen from Lake Mahopac has the second vein bifurcate near its tip, in both wings, with the appendage in the submarginal cell.

Rhagoletis suavis subsp. **completa** new subspecies (Pl. XVI, fig. 9.)

This is no doubt a subspecies of the Eastern black walnut maggot, in which the median hyaline costal triangle of *suavis* assumes a more or less complete, transverse band, extending at least to the fifth vein.

Description.—Of a general ferruginous to tawny color; with a faint median stripe, lateral and posterior portion of the mesonotum, upper portion of pleura including metanotum, fore coxae, all femora beneath and basal portions of second to fifth abdominal segments, brown to black. Frons and occiput medianly, mesonotum in general, pectus, abdomen in general, ferruginous. Face, antennae, palpi, posterior orbits, humeri, notopleural stripe, scutellum, apices of second to fourth abdominal segments, femora above, all tibiae and tarsi, yellowish white. Mesonotum medianly (leaving lateral margins and posterior area including prescutellar bristles, shining) subopaque, ochreous pollinose, with numerous, short, golden hairs. Bristles of posterior orbits pale. Wings as figured (Fig. 9); similar to *suavis*, but the hyaline area beginning at the costa beyond tip of first vein extends as a transverse band, at least, to the fifth vein, generally to the inferior margin. In some specimens there is a diluted spot in the portion of the infuscated band in the apical part of the discal cell, sometimes occupying almost entire apical portion, with a streak of same dilution extending through the proximo-median band in discal cell. The median hyaline band often broader than is shown in the figure. Length, 4 to 7 mm.

Type.—Male; Chino, San Bernardino County, California, (A. M. Boyce; August 10, 1928; infesting the exocarp of the Persian Walnut, *Juglans regia* Linn.), [A. N. S. P., no. 6341]. *Paratypes.*—3 ♀; topotypical, [A. N. S. P.]. 3 ♂, 4 ♀; topotypical, August 15, 1925, [U. S. N. M.]. 2 ♂, 3 ♀; Pomona, Los Angeles County, California, August 10, 1929, (L. Gammon), [Cal. Dept. Agr.].

In addition to the above, I have examined 2 ♂, 3 ♀, Pecan Bayou, Texas, September 28, 1918, (A. I. Fabis; on walnut, 26, VIII, 18; Quaintance no. 16946), [U. S. N. M.]; and 3 ♂, 1 ♀, Brownwood, Texas, September 28, 1917, (A. I. Fabis; on walnut, 17, VIII, 18; Quaintance no. 16829), [U. S. N. M.]. These specimens are much smaller, 4 to 5 mm. in length, and with much paler markings on the wings, but are apparently conspecific with those from California.

Rhagoletis boycei new species (Pl. XVI, fig. 10.)

Here we have a species in which the wings design suggests some species of the genus *Rivellia* in the narrowness and the intensity of the black bands. From all known North American species it is readily distinguished otherwise by the clouding of the ultimate section of the fourth vein.

Black; head except eyes and occiput medianly, antennae, palpi, humeri, notopleural stripe, scutellum except extreme base, halteres, squamae, apices of second to fourth abdominal segments, fore tibiae, and all tarsi, pale yellow to tawny. Base of wings, costa and veins near same in hyaline areas, yellowish. Head and mesonotum medianly opaque to subopaque, latter evenly ochreous pollinose with short, golden hairs. Abdomen subopaque with pale hairs except on fifth segment. Lateral portions of mesonotum, pleura, metanotum, and femora, more shining. Postorbital cilia and all bristles dark. Chaetotaxy normal. Wings rather long and slender, hyaline with sharply defined black bands as figured (Fig. 10). Length, 4 to 6 mm.

Type.—Male; Carr Canyon, Huachuca Mountains, Cochise County, Arizona, (A. M. Boyce; August 13, 1929; infesting the exocarp of the Persian Walnut, *Juglans regia* Linn.), [A. N. S. P., no. 6342]. *Paratypes.*—2 ♂, 2 ♀; topotypical, [A. N. S. P.]. 1 ♂, 1 ♀; topotypical, [U. S. N. M.].

Rhagoletis juglandis Cresson (Pl. XVI, fig. 11.)

1920. *Rhagoletis juglandis* Cresson, Ent. News, xxxi, p. 65. [♂; Arizona; in fruit of *Juglans regia*].

This is an entirely yellowish species with the usual whitish notopleural stripe and scutellum; and the infuscated band of the wings very narrow (Fig. 11) with the subbasal one absent or very faint.

The species was originally described from thirteen males collected by C. R. Biedermann from larvae found mining the exocarp of the Persian Walnut in Carr Canyon, Huachuca Mountains, Arizona. The writer recently received from Mr. A. M. Boyce of the Citrus Experiment Station, Riverside, California, three males and a female of this species which he collected at the type locality and says that it is doing serious damage to the walnut there. Dr. J. M. Aldrich of the National Museum, also sent me six males and three females from the type locality.

EXPLANATION OF PLATE XVI

All figures of wings enlarged x 10.

Fig. 1. *Rhagoletis cerasi* (Linnaeus).

Fig. 2. *Rhagoletis fausta* (Osten-Sacken).

Fig. 3. *Rhagoletis striatella* van der Wulp.

Fig. 4. *Rhagoletis tabellaria* (Fitch).

Fig. 5. *Rhagoletis ribicola* Doane.

Fig. 6. *Rhagoletis cingulata* (Loew).

Fig. 7. *Rhagoletis pomonella* (Walsh).

Fig. 8. *Rhagoletis suavis* (Loew).

Fig. 9. *Rhagoletis suavis* subsp. *completa* n. sp.

Fig. 10. *Rhagoletis boycei* n. sp.

Fig. 11. *Rhagoletis juglandis* Cresson.

VARIATIONS IN WING RETICULATION AND SIZE OF ERYTHRODIPLAX BERENICE WITH REGARD TO GEOGRAPHICAL DISTRIBUTION[1]

(ODONATA: LIBELLULIDAE)

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Considerable work has been done heretofore by way of determining the correlation of geographical distribution and the size of various insects or of certain parts of insects. The results of these investigations show a general increase in size in specimens studied from North to South, or from cooler to warmer regions.

For example: John R. Huggins[2] made a study of a species of Odonata *(Calopteryx maculata)* from Maine and Southern Ontario in the North to New Smyrna, Florida, in the South. The lengths of the following parts were taken; body, abdomen, caudal femur, caudal tibia, fore wing and hind wing. The data recorded by Mr. Huggins show a distinct increase in the length of all these various parts from North to South. Mr. Huggins also calls attention, in his report, to several other investigations. Rehn and Hebard,[3] in "A Revision of the Species of the genus Atlanticus," report a general increase in body length (Staten Island, New York, three specimens 20 mm. to River Junction, Florida three specimens 25.7 mm.) of a grasshopper *(Atlanticus testaceus)*. For another species *(Orchelimum glaberrimum)* they report a body length of 20.2 mm. in case of Lakehurst, New Jersey, to Florence, South Carolina, 25.5 mm. and South Jacksonville, Florida, 24 mm. (in all these cases males).

The purpose of this investigation is to determine, in a species of dragonfly *(Erythrodiplax berenice* Drury*)* the relation of denseness of reticulation of the wings, especially along their hind margins, to length and width of wing and to length of abdomen and of all these to geographical distribution.

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[1] A Thesis offered in partial fulfillment of the requirements for the degree of Master of Science, University of Pennsylvania, Philadelphia, Penna.

[2] J. R. Huggins "Variations in Size of Calopteryx maculata and a Proposed new species."

[3] Trans. A. E. S., XLII, p. 42. 1927.

This species, including at least two sub-species in the sense of the code of the American Ornithologists Union,[4] is a sea coast species whose larvae live in brackish water. Adult specimens were studied from Connecticut in the North to Colon, Panama, in the South.

This species has been found as far north as Cambridge, Massachusetts[5] and as far south as Panama. Dr. P. P. Calvert mentions in "Biologia Centrali Americana", one individual found in Thousand Islands, New York, in the St. Lawrence River and also specimens found occasionally near Philadelphia, Pennsylvania. These are cases, more than likely, where the insects have been carried by the winds or some other agency.

In this investigation, studies were made of both male and female adult specimens. In some cases only one specimen could be obtained from a locality and this, of course, does not give as accurate an indication as if a larger number could have been procured and the average taken, because considerable variation was found in specimens from the same locality.

The observations made on both male and female specimens were: (a) number of cells in both fore and hind wings between the stigma and nodal sector[6]; (b) between the subnodal and median sector; (c) between the short sector and the first sector of the triangle, counted in all three cases along the hind margin: (d) the length of the wings; (e) the width of the wings, taken at the nodus; (f) the length of the abdomen, including the abdominal appendages.

One hundred and twenty-eight specimens in all were studied. The specimens as listed in Table I are *berenice* type down to and including those from Matagorda, Texas. The remainder are *E. berenice naeva* Hagen, with the exception of the specimen from Altamira, Mexico, which is a form intermediate between *berenice* type and *E. berenice naeva*.

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[4] Code of Nomenclature, 1892, p. 31.

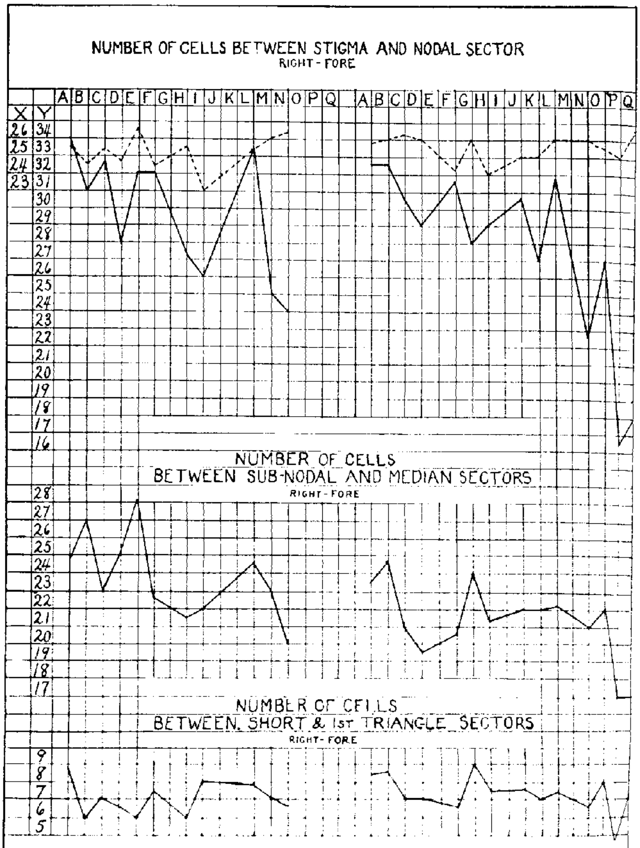
[5] Howe, Mem. Thoreau Mus. Nat. Hist., II, p. 11, 1921.

[6] The old Selysian nomenclature for the wing-veins is employed.

TABLE I

NO. SPMNS.	LOCALITY		NUMBER OF CELLS BETWEEN						LENGTH OF WING MM		WIDTH OF WING MM		LENG. OF ABD. MM
			STIGMA AND NODAL SECTOR		SUBNODAL AND MEDIAN SECTOR		SHORT SECTOR AND FIRST SECTOR OF TRIANGLE						
			FORE	HIND	FORE	HIND	FORE	HIND	FORE	HIND	FORE	HIND	
21	SACHEM HEAD CONN. ♂	R	34	33.6	24.7	28.8	8.8	15.4	25.5	24.4	6.3	8.4	224
		L	35.5	32.9	24.2	28.6	8.4	15.8	25.2	24.2	6.3	8.5	
33	″ ″ ″ ♀	R	32.5	32.2	23.4	27.8	8.3	14.9	25.7	24.7	6.2	8.4	22
		L	32.5	32	23	27	8.1	15.2	25.5	24.4	6.2	8.5	
1	SEA ISLE CITY N.J. ♂	R	31	32	27	28	6	14	24.5	23.5	6	7.5	20
		L	32	29	24	30	8	15	24.5	23.5	6	7.5	
2	″ ″ ″ ″ ♀	R	32.5	30.5	24.5	29.5	8.5	14.5	26	25	6	8.5	22
		L	31.5	32.5	23.5	29.5	8	16	25.5	24	6.2	8.5	
2	BAY RIDGE MD. ♂	R	325	32	23	295	7	155	252	237	6	8.2	212
		L	305	28	24	265	8.5	15	25	235	6	8.2	
2	″ ″ ″ ♀	R	30.5	305	21	25	7	12.5	262	252	6.5	8.7	22
		L	30	30	19	245	6.5	13	262	252	6.5	9	
2	CHESAPEAKE BEACH MD ♂	R	28	295	25	26	6.5	14	247	235	6	8.2	21.7
		L	30	265	23	26	7	15	24.7	23.5	6	8	
2	″ ″ ″ ♀	R	29	285	195	23	7	135	26	25	6	85	22
		L	295	29	18	23	6	13	26	25	6	8.5	
2	BUCKINGHAM CO. VA. ♂	R	32	34	28	28	6	16	26.5	25.5	6	8.5	225
		L	36	36	23	29	7	14	27	25.5	6	8	
3	MANETO N.C. ♂	R	32	31.6	22.6	28.6	7.3	13	24.3	23.3	6	8.1	21.3
		L	30.6	30.6	22.6	26.3	7	14.3	24.1	23.3	6	8.1	
2	″ ″ ♀	R	31.5	29.5	20.5	25.5	6.5	13	24.2	23.2	6	8.2	20.8
		L	30.5	30	20.5	24	6.5	12.5	24.2	23.2	6	8.2	
1	ST. SIMONS IS. GA. ♀	R	28	29	24	27	9	14	26	24.5	6	8	
		L	27	27	24	27	8	13	26	24.5	6	8	
5	FERNANDINA FLA. ♂	R	27.2	27.6	21.4	25	6	12.8	25.5	24.2	6.2	8.2	
		L	28	26.2	21.4	25.4	6	13	25.4	24.2	6.2	8.2	
3	″ ″ ♀	R	29	26.3	21.3	25.6	7.3	13.5	24	23.3	5.6	7.6	
		L	25.6	24.6	22	24.3	7	13.6	24.5	23.3	5.6	7.6	
1	BILOXI MISS. ♂	R	26	28	22	28	8	12	23	22	6	8.5	22
		L	25	29	23	25	7	12	23	22	6	8.5	
2	APPALACHICOLA FLA. ♀	R	30.5	27.5	22	25.5	7.5	13	25	24	6.2	8.4	
		L	27	28.5	21.5	23.5	6.5	13	25	24	6.2	8.3	
1	TERREBONNE PARISH LA. ♀	R	27	27	22	26	7	14	25	24	6.6	9	22
		L	26	29	21	25	7	15	25	24	6.5	9	
7	MATAGORDA TEXAS ♂	R	33.4	32.4	24.5	28.7	7.8	14	25.2	24.2	6.3	8.3	22.7
		L	34	31.8	24.1	29.2	7.5	13.8	25.2	24.2	6.3	8.3	
13	″ ″ ♀	R	31.8	31.2	22.1	27	7.3	13.6	26	25	6.5	8.5	22.6
		L	31.8	31.2	23.5	27.9	7	13.8	26	25	6.5	8.5	
1	SANTA ROSALIE L.CAL. ♂	R	25	18	23	19	7	12	26	24.5	6	8.5	22
		L	23	24	18	18	6	13	26	25	6	8	
3	MIAMI FLA. ♂	R	24	23.6	20	22.6	6.6	13.3	26.3	25.3	6.3	8.1	23.3
		L	24.6	23.6	21	23	7.3	13.3	26.3	25.3	6.3	8.1	
2	″ ″ ♀	R	22.5	26	21	23.5	6.5	13	26	25	6	8.2	22
		L	24	22	21.5	24	6.5	14	26.5	25	6	8.2	
1	ALTAMIRA MEXICO ♀	R	27	30	22	24	8	13	29	27.5	7	10	24
		L	27	28	21	23	7	14	29	27.5	7	10	
2	CROOKED ISLE BAHAMA ♀	R	16.5	18	17	18	4.5	10	25	23.2	5.7	7.5	20.2
		L	17	16.5	17.5	17	5	10	25	23.2	5.7	7.5	
1	GOVERNORS HARBOR ″ ♀	R	18	16	17	17	7	9	26.5	25	6	8	21.5
		L	17	16	17	18	7	11	26.5	25	6	8	
1	CUBA ♀	R	17	16	14	18	4	7	24	23	6	7.5	19.5
		L	18	16	14	18	5	8	24	23	6	7.5	
4	INAGUA ♂	R	23.5	23.2	20.5	22.2	6.2	12.7	26.2	25.2	6.1	7.8	23
		L	24.2	22.7	20.5	23.7	6.5	12.7	26	25	6	7.6	
4	″ ♀	R	24	23.7	19.5	21.2	6	11.5	27.2	26.2	6.1	8.1	23
		L	23.2	22.5	19.2	22.5	7.2	11.5	27.1	26.1	6.2	8.3	
1	KINGSTON JAMAICA ♀	R	16	16	15	16	4	9	24.5	22.5	5.5	7	17.5
		L	17	18	17	18	5	8	24.5	22.5	5.5	7	
2	COLON PANAMA ♂	R	20	20	18	19	6	11	25	23.5	5.5	7.5	21
		L	20	20.5	17	17.5	6	11.5	25	23.5	5.5	7.5	
2	″ ″ ♀	R	22	19.5	17.5	19.5	5	10.5	23.5	22.5	5.5	7.5	19.7
		L	20	19	16	19	5	10.5	24	22.7	5.5	7.5	

TABLE II.



A - SACHEM HEAD
B - SEA ISLE CITY
C - BAY RIDGE
D - CHESAPEAKE BEACH
E - BUCKINGHAM CO
F - MANETO
G - ST SIMONS ISLE
H - FERNANDINA
I - BELOXI
J - APPALACHICOLA
K - TERREBONNE PARISH
L - MATAGORDA
M - SANTA ROSALIE
N - MIAMI
O - ALTAMIRA
P - CROOKED ISLES
Q - GOVERNORS HARBOR

Table I shows the averages of the results of these observations arranged in the order of their latitude, from Sachem Head, Connecticut, in the north to Colon, Panama, in the south. The averages for the male and female are listed separately for each locality.

Little variation is shown here for length of wings and length of abdomen. There seems to be no general agreement in these respects between this species and the one investigated by Mr. John R. Huggins *(Calopteryx maculata)* which shows an increase in length of abdomen from 33 mm. in Manchester, Maine, specimens to 45.2 mm. in New Smyrna, Florida, specimens; wing length from 29.7 mm. (fore) 28.7 (hind) in Manchester, Maine, specimens to 35.6 mm. (fore) 34.5 mm. (hind) in New Smyrna, Florida, specimens. Simply the fact that these are two different species of Odonata would not account for this variation, but the fact that *Calopteryx maculata* is an inland species while *E. berenice* is a coast species might be a plausible explanation.

The cheif interest of this investigation, however, is that of variation of reticulation of the wings. Table I shows rather a steady decrease in the number of cells along the hind margin of the wings from north to south, with the exception of those from Matagorda, Texas. Here we find the numbers showing a marked similarity to those of the Connecticut group in almost every respect.

Explanation of Graphs

The graphs of Table II were made from the averages of the number of cells in the hind margin of the right fore wing. Graphs, for the three wing regions considered, were made. Those on the left side being of the male, and those on the right side of the female.

The same ordinates were used for both male and female in order that a comparison could be made of the variation in the different wing regions for the two sexes.

The dotted line graph is that of the right wing lengths of the specimens from the different localities. These graphs were drawn in connection with the graphs of the wing reticulation of the first regions, in order to show more clearly whether or not there is any correlation between reticulation of the wings and the length of the wings.

Ordinates X, equal average wing lengths taken from Table I.
Ordinates Y, equal average number of cells taken from Table I.
Abscissae, localities (Legend at foot of page .)

This graph of the right wing lengths of the male and female over those of the right wing reticulation for the one region of the wing, shows clearly that there is practically no correlation between denseness of reticulation of the wings and the length of the wings. If the wing length graph be compared with any one of the three sector graphs of number of cells we find that in one locality the specimens may show a decrease in length of wing and an increase in number of cells while those from another locality may show an increase in wing length and decrease in number of cells.

Table III brings together the collective averages of counts and measurements for both male and female for the three localities Sachem Head, Connecticut, Matagorda, Texas, Colon, Panama, and shows more clearly the similarity of the Matagorda, Texas, group to the Connecticut group, and the difference between these groups and the most southern group.

TABLE III.

NO. OF SPMNS	LOCALITY		NUMBER OF CELLS BETWEEN STIGMA AND NODAL SECTOR		SUBNODAL AND MEDIAN SECTOR		SHORT SECTOR AND FIRST SECTOR OF TRIANGLE		LENGTH OF WING MM		WIDTH OF WING MM		LENG OF ABD MM
			FORE	HIND	FORE	HIND	FORE	HIND	FORE	HIND	FORE	HIND	
54	SACHEM HEAD CONN. ♂ ♀	R	332	329	24	283	8.5	15.1	256	245	62	84	222
		L	33	32.4	236	281	8.2	15.5	25.3	243	6.2	85	
6	MATAGORDA TEX. ♂ ♀	R	324	324	331	268	7.5	134	259	252	64	8.4	226
		L	326	31	22.5	269	7.3	14	25.9	249	6.4	8.5	
4	COLON PANAMA ♂ ♀	R	21	19.5	177	192	5.5	107	245	23	5.5	7.5	201
		L	20	197	16.5	182	5.5	11.2	245	23	5.5	7.5	

TABLE IV.

18	SACHEM HEAD CONN form I	R	325	321	237	28	85	145	258	248	62	85	224
		L	325	318	233	28	8	153	25.6	24.5	6.2	85	
15	.. .. .. form II	R	325	322	23	277	82	154	257	246	62	84	217
		L	325	32	228	274	83	152	255	244	6.3	85	

Table IV shows the averages for the two female color Forms I and II of the Sachem Head, Connecticut, group. We see here that there is no significant difference between these two forms as far as these observations are concerned.

Table V gives the approximate latitude of the different localities from which specimens were studied, also the mean annual temperature and precipitation taken from "The Climatology of the United States" by A. J. Henry[7] and "Climatological Data for the West Indian Islands" by W. W. Reed.[8] In some cases this information was not given for the exact locality from which the specimens were obtained and in these cases the data for near-by localities were used.

Table VI shows the distribution of these groups for latitude, temperature, precipitation and the averages of counts of the marginal cells (♂ and ♀, right and left) of the region between the stigma and nodal sector of the fore wings, the last taken from Table I.

TABLE V

		Lat.		Mean Annual Temp. °F	Mean Annual Precip. Inches
		Deg.	Min.		
A	Sachem Head, Connecticut	41	15	49.0	43.8
B	Sea Isle City, New Jersey	39	10	52.0	42.0
C	Bay Ridge, Maryland	38	50	54.0	43.5
D	Chesapeake Beach, Maryland	38	42	55.0	40.7
E	Buckingham County, Virginia	37	60	56.0	49.8
F	Maneto, North Carolina	35	50	64.0	49.1
G	St. Simons Isle, Georgia	31	12	66.0	51.0
H	Fernandina, Florida	30	40	74.0	58.7
I	Beloxi, Mississippi	30	26	67.0	61.3
J	Appalachicola, Florida	29	45	68.0	56.8
K	Terrebonne Parish, Louisiana	29	20	70.0	55.2
L	Matagorda, Texas	28	15	70.0	26.8
M	Santa Rosalie, Lower California ..	27	30	74.0	25.0
N	Miami, Florida	25	45	75.0	58.3
O	Altamira, Mexico	22	20	79.0	90-100
P	Crooked Isles, Bahamas	22	7	77.0	32.28
Q	Governor's Harbor, Bahamas	22	00	77.0	32.28
R	Cuba	22	00	76.6	54.99
S	Great Inagua, Bahamas	20	30	77.0	32.28
T	Kingston, Jamaica	18	00	79.6	32.52
U	Colon, Panama	9	22	79.1	125

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[7] 1906. Bulletin Q, U. S. Weather Bureau.

[8] 1926. April Monthly Weather Review, Vol. 54, p. 133-160, U. S. Weather Bureau.

TABLE VI

Latitude	A B C D E F G H I J K L M N O P Q R S T U
Temperature	A B C D E F G I J K L H M N R S P Q U T O
Precipitation	M L P Q S T D B C A F E G R K J N H I O U
Number of Cells, 1st Segment	E A L B F C D J H G O K I M N S U Q R P T

This table shows a fairly good correlation between latitude and temperature distribution, less of a correlation between latitude and wing reticulation, and still less for precipitation and latitude. There seems to be a better correlation between temperature and wing reticulation than between precipitation and wing reticulation. This agrees, in a measure, with the general belief that the climatic factors, temperature and precipitation, are of greatest importance in the development of animals; perhaps temperature more so than precipitation.

From the study of Table VI it would seem that some condition other than temperature and precipitation are responsible for the difference in the number of cells. For example L of the cell number comes closer to the L of precipitation than to the L of temperature, while the A of cell number comes closer to the A of temperature than to the A of precipitation. G of cell number is as far from G of precipitation as it is from G of temperature while O of cell number is rather far removed from the O of both temperature and precipitation. In other words there seems to be more irregularity in the cell number line than would warrant the belief that temperature and precipitation are the only factors bringing about this variation.

There is a close resemblance between the Florida specimens, especially those from Miami, and the Inagua specimens which would seem to indicate a close relationship between these groups. The other two Bahama groups agree closely with those of the Greater Antilles while the specimens from the most southern locality, Colon, Panama, show a slightly larger number of cells in the hind margins of the wings.

The variation in wing reticulation of the specimens studied is not closely enough correlated with either temperature or precipitation to justify the opinion that they are the sole factors leading to this condition. If the veinlets which define the wing cells give strength to the wing; if flight is chiefly for the purpose of catching prey, then there may be the possibility that, with the more abundant supply of food insects in the warmer localities, there is less need for much flying and consequently the decrease in the number of veinlets. A study of the wing muscles of specimens from the various localities might give some value to this theory. However no change takes place in the adult stage and the material forming these veinlets is not living material and therefore is not on the same basis as a living part of an animal body which, though functional at one time, disappears because the animal has adapted itself to an environment in which that part is no longer useful. It is therefore not likely that any condition affecting that part of the wing would be carried into the early stages of the life history of this species.

I am greatly indebted to Dr. P. P. Calvert for his kindly criticism and advice and to the following for the loan of specimens used in this study:

The Academy of Natural Sciences of Philadelphia, P. P. Calvert, University of Pennsylvania, Mr. E. B. Williamson, Bluffton, Indiana, Mr. W. T. Davis, Staten Island, New York.

A STUDY OF THE LARVA OF CALOPTERYX (AGRION) MACULATA

(ODONATA: AGRIONIDAE)

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Since no account of the earlier instars in the development of the common dragon-fly, *Agrion* (*Calopteryx*) *maculatum*, has been given, it is hoped that the following account will supply enough data to enable one to recognize the larva of this species.

It is known that the adult of this species seems to prefer a small rather quiet stream along the edge of a wood. It was, therefore, in this region that search was made for the adult in the hopes that eggs might be secured. The first search, about the middle of June, brought little results. On this initial trip only five *maculata* were seen. These were always observed singly and never in pairs. On the next trip which was to the same creek, Crum Creek, Delaware County, Pennsylvania, at a point across the meadows from the Woodland station, about the same number of dragon-flies were seen. Some of these were in pairs, but mating did not occur. Perhaps the appearance of this species was delayed this year (1928) because of the rather cold season. At this same place on several trips towards the last of June, a number of *maculata* were seen. In a stretch of from five to six hundred feet along the creek one day I was able to note more than fifty adults.

Agrion maculatum is not an active flier, but spends much of its time resting on leaves along the water's edge, making occasional short flights over the water and then returning to feed on a small gnat or mosquito which it has succeeded in capturing. During the mating period, however, peace no longer reigns except during feeding, especially in the morning and just before dusk in the evening. Whether dragon-flies experience such emotions as love and hate can not be ascertained. It is certain, however, that each male is zealous in protecting his mate. While the female is depositing her eggs, her mate is close at hand to ward off any other suitor. I have noted five of these males at one time each guarding a particular spot along the stream. If his neighbor flies too close to this region a fight results and in nearly every case the encroacher is driven back to his own stronghold. These battles are, indeed, curious affairs, never fatal so far as I have noticed, but always furiously fought. The dragon-flies come at each other in a manner which would remind one of cocks' fighting. After darting at one another at full speed many times, they seem to tire and will then come close to one another with the wings rapidly vibrating until one or the other leaves for another place. He is then pursued by the victor, but as soon as the pursued one reaches his own sanctuary he becomes the aggressor and drives the former victor away. The females seem to be more peace-loving, but even they will tire of too many ardent suitors and will drive them away.

On the thirtieth of June I noted that several females were ovipositing. One female deposited her eggs in the moss covering an old wheel in the creek, another oviposited in the side of a decaying log, still a couple more were ovipositing in the stems of grasses. Several of the grasses were gathered and placed in a jar with water, but none of the eggs hatched. The grass became soft and decomposed in a few days, although the water was renewed every day, care being taken lest some larvae might have hatched and would be poured out with the water.

In every case in which oviposition was noted, the dragon-fly alighted on the object in which she was to lay her eggs, placed her abdomen, or at least the tip of it, below the surface of the water, and always held the wings in a position of rest, *i. e.*, upright over the body.

On July 4th, at about ten o'clock, I noted many females ovipositing in the stems of the common water cress, *Radicula nasturtium-aquaticum*. Seven females were observed at one time on one cluster of cress. I gathered several of these plants taking the roots along hoping that they would help to keep the plants alive long enough to allow the eggs to hatch. The eggs could not be seen at first, but as soon as the stalks began to get white and soft after being in the water for a week, the eggs could be seen below the epidermis of the plant stem. On this same day a female was observed ovipositing in the stem of the common moneywort, *Lysimachia nummularia*. (I am indebted to Dr. W. Steckbeck, of the Botany Department of the University of Pennsylvania, for the classification of this plant.) After she had deposited some eggs, had been frightened away by a suitor which had succeeded in eluding the vigilant mate, and had returned and had begun to deposit more eggs, I decided to catch her, but was too late, for an ardent suitor, having watched his opportunity, clasped her about the neck with his inferior appendages and bore her away with him. When not ovipositing the female protects herself by raising and lowering her wings as she rests upon a leaf. While she is depositing her eggs, she is at the mercy of her admirers, as her wings are quiet. She is intent upon her duty of egg-laying and moves the wings only to balance herself. From the moneywort in which this female deposited her eggs on July 4th, larvae began to hatch on July 19th. The last larva from these eggs hatched on July 21st. From some cress obtained from Crum Creek on July 19th, a single larva hatched, but died before moulting. On July 20th the eggs and larvae were placed in bottles and transported to my home in New York State, a distance of about 265 miles.

The young larvae of *maculatum* are slow-moving individuals, usually walking along the bottom of the container in which they were kept. The antennae are long and are held downward, probably serving as feelers. If the larva swims, this is done by switching the abdomen from side to side as the larva slowly progresses. This method differs from that of the larvae of the Anisoptera which get away very rapidly by ejecting water from the rectum.

Food and Food Habits

The habits of food getting in *Calopteryx maculata* are not very different from those of *Sympetrum vicinum*. *Calopteryx* is, however, very slow and, unless unusually hungry, will allow daphnias to swim about it without making an attempt to catch them. Often the small mayfly and stonefly larvae which were fed to the older *maculata* larvae would crawl over the bodies of the latter and seemed to cause them no discomfort. In fact the larva of *macula-*

ta seems to be a rather stupid animal, differing from the Aeshnid larva which had been studied in its later larval stages. The latter seemed to know when it might expect food, so that as soon as the light on my desk was snapped on it would look for food, but *Calopteryx* never did so, but remained at the bottom of the glass container, clung to its sides or, if a stick was present as in the last larval instars, the larva rested upon the stick or hung, with head downward beneath it as if watching for its prey.

The larvae were at first provided with Paramecia and other protozoa, but did not seem to feed upon them, so were furnished with small Ostracods. Several of the larvae were seen to eat these before the first ecdysis. As the larvae became larger, larger Ostracods and Copepods, especially a species of Cyclops, were used as food. In addition to these, many other fresh water animals were present in the water which served as a home for the larvae. During the last few instars daphnias and mayfly and stonefly larvae served as food. *Calopteryx* seemed never to kill its prey unless it ate it. This was not true of the Aeshnid larva which often killed animals which it made no effort to eat.

Of the larvae which hatched between the 19th and 21st of July, only three lived beyond the second instar. These died in the fifth instar. The last one to die evidently perished from the effects of being brought in a closed jar back to Philadelphia, although it lived for more than a day after arrival there.

Previous to death, larvae numbers 5 and 1, the other larvae to reach the fifth instar, each lost a part of the legs. The breaking point seemed always to be at the point of junction between the femur and the trochanter. At the time that this was noticed, some very voracious Ostracods were present in the containers with the larvae. The fact that the legs broke at the same point in each case might indicate that the Ostracods did not break them off. Therefore, if these crustaceans had anything to do with this breaking off of the legs, they may have furnished merely the stimulus which caused the larvae to cast off their legs in much the same manner that the crayfish casts off its legs when caught by an enemy. Again the point between the femur and the trochanter may be the most fragile part of the leg and for this reason is the place where breaking will always occur.

Larval Characters More or Less Constant

The following characters were quite constant for all instars: the body is long and slender; the first *antennal* joint is long, the second joint is usually partly dark—the apical part being the darker; the *eyes* are not large and never approach one another either in the larval or in the adult forms; a blunt horn-like projection is present on either side of the head in the postocular region; there is one movable hook on each *labial palp*. *Mandibles* in later instars are as represented in Plate XVII, figures 8-11; the denticle *y* is not present until the quartult instar, if present in the quintult instar it is very minute; the apical tooth no. 1 on the right mandible appears first as a minute structure in the fifth instar. In early instars there are two distinct proximal teeth with smaller teeth between them, later these latter become more prominent proportionately (compare Pl. XVII, figs. 6-11). *Legs* long and slender; each bears two tarsal claws; the legs of living specimens seemed to be lighter in color than the rest of the body, this is especially noticeable in the early instars, in which a very light brown band may be seen on the femora of some individuals; in later instars a greater number of bands are present, *i.e.*, three on the femora and three on the tibiae; in the last instar there is a distinct white band between the distal and middle brown bands. The *abdomen* is somewhat darker towards the apical end in most individuals, in the larvae and exuviae, especially after the first few instars, which have not been preserved in alcohol, a dark stripe may be seen extending from the head upon the thorax and reaching the meta-thorax, one or two dark spots on each abdominal tergite, except the last, in a lateral apical position; in many individuals a slight projection is noticed near the apex of each abdominal tergite; three *tracheal gills*, differing slightly in coloration in different individuals and in different stages in the development of the same individual, are present; the lateral gills become more three-sided in later instars, the middle gill remains comparatively flat.

Time Data

Dates on which exuviation occurred in larva number one, the larva in which the first four exuviae were perfect are: 1st, July 30; 2nd, August 8; 3rd, August 15; 4th, August 21st. Dates on which the three larvae carried to the fifth instar died are, no. 1: September 9th; no. 5: August 29th; no. 9: September 10th.

On September 15th, four living larvae of *Calopteryx maculata* were taken at Crum Creek at the point where the eggs had been secured in July. Judging from the size and appearance of the antennae, wing-pads, etc., it seems that these larvae had molted five or, in the case of three of them, more than five times. Not all of them were in the same stage of development. Of these four, one died without moulting, two died in the last instar and the remaining one transformed on May 10th, 1929, into a perfect male. By this transformation no doubt was left concerning the species represented.

Transformation

Transformation in *Calopteryx maculata* does not differ essentially from the accounts of transformation given for Odonata by Tillyard (1917) or by Carpenter (1921). The individual whose transformation I observed was a female taken in the last larval instar.

For several days previous to transformation no food was eaten, the larva remained partly out of the water resting on a stick which projected from the glass bowl in which the larva was kept. When ready to transform, at about 1 A. M., the larva climbed out to the end of the stick and hung there in a vertical position. Its claws were firmly fastened in the wood. The larva was not motionless, but swung back and forth and moved the abdomen from side to side. The first splitting of the skin was transverse, at the base of the meso-thoracic wing-pads. The splitting then became longitudinal along the middorsal line and extended cephalad. The head now appeared, then the wings and the three pairs of legs in order. The tail end of the abdomen still remained in the exuvia and held the imago which had bent backwards. The wing-pads were small and rather rough and brown in color. At 1.45 the abdomen was still in the exuvia. The wings began to elongate slightly. At 1.54, or 14 minutes after the first splitting on the thorax, the imago grasped the exuvia with the front legs and in a short time withdrew the abdomen from the exuvia and remained in a vertical position clinging to the exuvia. The wings now increased more rapidly in length than the abdomen, so that at 2.10 they reached the eighth abdominal segment. The veins at the base of the wings were now distinct. The wings had become a very light brown color and were rather flaky in appearance. Still later the wings became a dirty white with the pterostigma a yellow-white. By 2.30 the wings began to turn brown in color. They seemed to have attained their full size and extended much beyond the tip of the abdomen which in the adult form extends much beyond the tip of the wings. By this time the thorax and abdomen were becoming darker in color, the thorax being much darker.

Measurements

Due to the peculiarity, native to the larva of *maculata,* of holding the abdomen at a higher level than the thorax, especially noticeable in the early instars in which the abdomen was held at a sharp angle with the thorax, I found that any measurements of the lengths of the animals would not be reliable. However, measurements of the width of the head and of the eyes through the fifth instar were made on living animals. Other measurements were made on dead larvae, or on larval exuviae. In many cases, a part of the exuvia or even of the dead larva was destroyed by Ostracods, although all specimens were observed daily.

Since it was found that the average of the measurements of the exuviae and of the larvae were practically the same, they are considered together for each instar.

Although cercoids were first observed in the tertiult instar, their length in that instar would tend to indicate their presence at an earlier date. If they are not examined before the gills are broken off, they are difficult to find.

An apparent discrepancy in the coloration of the larvae will be noted. After being kept in alcohol the color may be removed. If the color of specimens was not recorded before being preserved in alcohol, the color of the alcoholic specimens is recorded.

The tracheal gills seem to be rather delicately attached and in many cases are broken off in handling. In all the specimens which I studied, if the gills became broken off, the larva would live only a couple of days. I have, however, taken larvae in which one or two gills were much shorter than the others, undoubtedly indicating their regeneration.

The number of larvae and exuviae examined in each instar is recorded with data on that instar.

Naming of Instars

The naming of the instars of the larvae secured at Crum Creek, in which the actual number of molts is not known, follows the nomenclature suggested by Dr. Calvert in his "Report" (1928). The instars are named beginning with the last and proceeding towards the earlier instars.

The writer wishes to express his appreciation to Dr. Philip P. Calvert for helpful suggestions especially in the preparation of this report.

POINTS DIFFERENTIATED	Number in the following lists
1. Length of larva or of larval exuvia	1
2. Head	
a. Size	
Length	2
Width	3
b. Width of eyes	4
c. Antennae	
Markings	5
Number of joints	6
Length of joints	7
d. Labium (Mask)	
Length of mentum from base to median cleft	8
Distance from base of mental cleft to point of greatest width of cleft	9
Distance from point of greatest width of mental cleft to apex of mentum	10
Greatest width of mentum	11
Palps	
Number of setae at base of the movable hook and of fixed hooks on a plane with it	12
Setae on median lobe of mentum	13
3. Thorax	
a. Length	14
b. Wing-pads	
Length of meso- and meta-thoracic wing-pads	15
Number of abdominal tergites covered by meta-thoracic wing-pads	16
c. Legs	
Number of tarsal joints	17
Relative length of tarsal joints	18

4. Abdomen	
a. Size	
Length exclusive of tracheal gills	19
Greatest width	20
b. Color markings	21
c. Length of cercoids	22
d. Tracheal gills	
Color markings	23
Length	24

First Instar[1]

1. Total length, Ave., 1.723 mm.; Range, 1.412–2.048 mm.
2. Length of head, Ave., 0.316 mm.; Range, 0.265–0.378 mm.
3. Width of head, Ave., 0.387 mm., Range, 0.350–0.406 mm.
4. Width of eye, Ave., 0.042 mm., Range, 0.029–0.060 mm.
5. Apical part, sometimes ⅓rd, of second antennal joint dark or black.
6. Antennae three-jointed.
7. Length of antennal joints: First, Ave., 0.173 mm., Range, 0.156–0.204 mm.; second, Ave., 0.076 mm., Range, 0.020–0.104 mm.; third, Ave., 0.173 mm., Range, 0.141–0.200 mm.
8. Length of mentum from base to median cleft, Ave., 0.337 mm., Range, 0.224–0.380 mm.

9 and 10. Median cleft of the mentum a line with average length 0.023 mm., Range in length, 0.016–0.032 mm.

11. Width of mentum, Ave., 0.318 mm., Range, 0.300–0.340 mm.
12. Two setae at base of the movable hook, the one nearest the hook very minute (Pl. XVII, fig. 1); one large fixed hook on plane with movable hook.
13. Only a slight marking where seta will appear on either side of mentum (Pl. XVII, fig. 1).
14. Length of thorax, Ave., 0.433 mm., Range, 0.363–0.520 mm.

15 and 16. No. wing-pads present.

17 and 18. One tarsal joint.

19. Length of abdomen, Ave., 1.035 mm., Range, 0.672–1.260 mm.
20. Width of abdomen, Ave., 0.271 mm., Range, 0.214–0.398 mm.

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[1] Sixteen larvae and exuviae.

21. Tenth abdominal segment usually black or brown at the origin of the tracheal gills, sometimes, however, the base of the segment is black and the apex light. This basal or apical ring may cover more than half of the tenth segment.
22. Cercoids absent.
23. Tracheal gills with the tip light, and usually with a brown band between the middle and apex of each gill.
24. Length of tracheal gills: Right, Ave., 0.464 mm., Range, 0.342–0.500 mm.; Middle, Ave., 0.448 mm., Range, 0.368–0.480 mm.; Left, Ave., 0.452 mm., Range, 0.308–0.517 mm.

Second Instar[2]

1. Total length, Ave., 2.037 mm., Range, 1.712–2.568 mm.
2. Length of head, Ave., 0.382 mm., Range, 0.342–0.436 mm.
3. Width of head, Ave., 0.435 mm., Range, 0.389–0.499 mm.
4. Width of eye, Ave., 0.052 mm., Range, 0.042–0.055 mm.
5. Second antennal joint only a little dark in specimens preserved in alcohol.
6. Antennae four-jointed.
7. Length of antennal joints: First, Ave., 0.221 mm., Range, 0.214–0.232 mm.; second, Ave., 0.108 mm., Range, 0.085–0.128 mm.; third, Ave., 0.096 mm., Range, 0.077–0.115 mm.; fourth, Ave., 0.115 mm., Range, 0.094–0.128 mm.
8. Length of mentum to base of median cleft, Ave., 0.423 mm., Range, 0.381–0.440 mm.

9 and 10. Distance from base of mental cleft to apex of mentum, Ave., 0.054 mm., Range, 0.044–0.070 mm.

11. Width of mentum, Ave., 0.386 mm., Range, 0.380–0.392 mm.
12. Two setae near base of movable hook, the one nearest the hook minute (Pl. XVII, fig. 2); two long fixed hooks on each palp in row with movable hook.
13. One blunt short seta present on either half of the median lobe of mentum, as in Pl. XVII, fig. 2.
14. Length of thorax, Ave., 0.498 mm., Range, 0.436–0.556 mm.

15 and 16. No wing-pads present.

17 and 18. One tarsal joint.

19. Length of abdomen, Ave., 1.199 mm., Range, 0.941–1.669 mm.

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[2] Six larvae and exuviae.

20. Width of abdomen, Ave., 0.290 mm., Range, 0.256–0.342 mm.
21. Last abdominal segment partly brown or black.
22. No cercoids present.
23. Tracheal gills with a brown band beyond the middle.
24. Length of tracheal gills: Right, Ave., 0.677 mm., Range, 0.599–0.730 mm.; Middle, Ave., 0.661 mm., Range, 0.607–0.734 mm.; Left, Ave., 0.697 mm., Range, 0.642–0.736 mm.

Third Instar[3]

1. Total length, 2.525 mm.
2. Length of head, 0.428 mm.
3. Width of head, 0.517 mm.
4. Width of eye, 0.042 mm.
5. Second antennal joint brown near the apex.
6. Antennae five-jointed.
7. Length of antennal joints:
   First, 0.268–0.269 mm.
   Second, 0.115–0.128 mm.
   Third, 0.064–0.068 mm.
   Fourth, 0.059–0.076 mm.
   Fifth, 0.128–0.136 mm.
8. Length of mentum from base to mental cleft, 0.570 mm.

9 and 10. Cleft of mentum a line 0.1 mm. in length.

11. Width of mentum, 0.474 mm.
12. Three setae at base of movable hook as in plate XVII, figure 3; two fixed hooks on plane with movable hook.
13. One seta on either side of the median lobe of mentum as in plate XVII, figure 3.
14. Length of thorax, 0.684 mm.

15 and 16. No wing-pads present.

17. Tarsus indistinctly two-jointed.
18. Distal tarsal joint nearly four times as long as the proximal joint, measured on the upper surface.
19. Length of abdomen, 1.412 mm.
20. Width of abdomen, 0.385 mm.
21. No distinct brown or black markings on the abdomen in the exuvia preserved in alcohol.
22. Cercoids absent.

23 and 24. Tracheal gills lost.

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[3] One exuvia and fragment of a second.

Fourth Instar[4]

1. Total length, 2.739–2.786 mm.
2. Length of head, 0.432–0.470 mm.
3. Width of head, 0.611–0.612 mm.
4. Width of eye, 0.068–0.072 mm.
5. Apical part of second antennal joint dark, the first and second joints darker than the remaining joints.
6. Antennae five-jointed.
7. Length of antennal joints: First, 0.342–0.342 mm.; second, 0.115–0.154 mm.; third, 0.098–0.115 mm.; fourth, 0.073–0.082 mm.; fifth, 0.133–0.149 mm.
8. Length of mentum to base of mental cleft, 0.580–0.730 mm.
9. Distance from base of mental cleft to point of greatest width of cleft, 0.046–0.054 mm.
10. Distance from point of greatest width of mental cleft to apex of mentum, 0.126–0.132 mm.
11. Width of mentum, 0.556-0.580 mm.
12. Three fixed hooks on plane with movable hook, the smaller one developing denticle-like near the proximal angle of the palp; three setae at base of movable hook as in plate XVII, figure 4.
13. One seta on either side of median lobe of mentum (Pl. XVII, figure 4).
14. Length of thorax, 0.813–0.877 mm.
15 and 16. No wing-pads present.
17. Tarsus three-jointed.
18. Middle tarsal joint at least one-and-one-half times as long as the proximal; distal joint scarcely as long as the other two.
19. Length of abdomen, 1.391–1.540 mm.
20. Width of abdomen. 0.389–0.393 mm.
21. Entire body brownish without noticeable black markings.
22. No cercoids present.
23. No noticeable color markings on tracheal gills.
24. Length of tracheal gills: Right, 1.393–1.412 mm.; middle, 1.198 mm.; left, 1.369 mm.

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[4] Two exuviae.

Fifth Instar[5]

1. Total length, 3.167-3.753 mm.
2. Length of head, 0.479-0.607 mm.
3. Width of head, 0.684-0.731 mm.
4. Width of eye, 0.162-0.171 mm.
5: First and second antennal joints brown, the second joint black towards the apex.
6. Antennae five-jointed.
7. Length of antennal joints: First, 0.432-0.470 mm.; second, 0.162-0.184 mm.; third, 0.119-0.166 mm.; fourth, 0.077-0.098 mm.; fifth, 0.134-0.160 mm.
8. Length of mentum to base of mental cleft, 0.520-0.740 mm.
9. Distance from base of mental cleft to the point of greatest width of cleft, 0.060-0.085 mm.
10. Distance from point of greatest width of mental cleft to apex of mentum, 0.160-0.295 mm.
11. Width of mentum, 0.636-1.189 mm.
12. Three setae at the base of the movable hook as in plate XVII, figure 5; three fixed hooks on plane with movable hook, the most distal one small.
13. One seta on either half of the median lobe (plate XVII, figure 5).
14. Length of thorax, 0.770-0.856 mm.
15 and 16. No. wing-pads present.
17. Three tarsal joints.
18. Middle tarsal joint about double the length of the proximal, the distal joint scarcely as long as the other two.
19. Length of the abdomen, 1.840-2.289 mm.
20. Width of abdomen, 0.406-0.470 mm.
21. Abdomen brown with the last three segments darker.
22. Cercoids absent.
23. Tracheal gills brown with a lighter area near the middle.
24. Length of tracheal gills: Right, 1.540-2.054 mm.; middle, 1.284-1.853 mm.; left, 1.485-2.045 mm.

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[5] Three dead larvae.

Sextult Instar[6]

1. Total length, 5.819 mm.
2. Length of head, 0.898 mm.
3. Width of head, 1.078 mm.
4. Width of eye, 0.124 mm.
5. First two antennal joints brown, the second with apical third black; other antennal joints lighter.
6. Antennae five-jointed.
7. Length of antennal joints: First, 0.693 mm.; second, 0.269 mm.; third, 0.196 mm.; fourth, 0.115 mm.; fifth, 0.175 mm. A very faint line may be noted in the third segment, this may be the dividing line between the third and fourth segments of the following instar.
8. Length of mentum to base of mental cleft, 0.877 mm.
9. Distance from base of mental cleft to point of greatest width of cleft, 0.184 mm.
10. Distance from widest point of mental cleft to apex of mentum, 0.286 mm.
11. Width of mentum, 0.898 mm.
12. Two large and one small immovable hooks on plane with the movable hook of palp; three setae at base of movable hook.
13. One seta on either half of median lobe of mentum.
14. Length of thorax, 1.326 mm.
15. Length of meso-thoracic wing-pad, 0.338 mm. Length of meta-thoracic wing-pad, 0.342 mm.
16. Wing-pads are erect and do not extend upon the abdomen.
17. Tarsus three-jointed.
18. Middle tarsal joint three times the proximal in length, distal joint nearly as long as other two.
19. Length of abdomen, 3.595 mm.
20. Width of abdomen, 0.642 mm.
21. Tenth segment darker than others.
22. Cercoids not distinguishable.
23. Gill dark with light band at base, apex and near the middle, a light spot between apex and middle.
24. Length of remaining gill, 0.312 mm.

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[6] One exuvia.

Quintult Instar[7]

1. Total length, 7.113 mm.
2. Length of head, 0.992 mm.
3. Width of head, 1.164 mm.
4. Width of eye, 0.210 mm.
5. Apical part of second antennal joint black, the first and second joints much darker than the apical joints.
6. Antennae seven-jointed.
7. Length of antennal joints: First, 0.856 mm.; second, 0.299 mm.; third, 0.128 mm.; fourth, 0.124 mm.; fifth, 0.128 mm.; sixth, 0.102 mm.; seventh, 0.051 mm.
8. Length of mentum to base of mental cleft, 0.984 mm.
9. Distance from base of mental cleft to point of greatest width of cleft, 0.171 mm.
10. Distance from point of greatest width of mental cleft to apex of mentum, 0.286 mm.
11. Width of mentum, 1.035 mm.
12. Three setae at base of movable hook, the proximal one minute; three fixed hooks on plane with movable hook.
13. One seta on either side of median lobe of mentum.
14. Length of thorax, 1.412 mm.
15. Length of meso-thoracic wing-pad, 0.342 mm. Length of meta-thoracic wing-pad, 0.343 mm.
16. Meta-thoracic wing-pad reaches over one-fourth of the first abdominal segment.
17. Tarsus three-jointed.
18. Middle tarsal joint about four times as long as the proximal, but slightly shorter than the distal joint.
19. Length of abdomen, 4.708 mm.
20. Width of abdomen, 1.027 mm.
21. Last abdominal segment black, the three preceding segments darker than the basal abdominal segments.
22. No cercoids present.
23. Tracheal gills brown with lighter base, one middle light band and with the apices light.
24. Length of tracheal gills: Right, 3.466 mm.; middle, 3.038 mm.; left, 3.458 mm.

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[7] One exuvia.

Quartult Instar[8]

1. Total length, 8.345–9.351 mm.
2. Length of head, 1.284–1.391 mm.
3. Width of head, 1.326–1.763 mm.
4. Width of eye, 0.256–0.342 mm.
5. Apical third of second antennal joint black, the remainder of the second and all of the first joint darker than the apical segments.
6. Antennae seven-jointed.
7. Length of antennal joints: First, 0.984-1.391 mm.; second, 0.385–0.419 mm.; third, 0.162–0.200 mm.; fourth, 0.128-0.175 mm.; fifth, 0.128–0.160 mm.; sixth, 0.098–0.122 mm.; seventh, 0.094–0.115 mm.
8. Length of mentum to base of cleft, 1.155–1.284 mm.
9. Distance from base of mental cleft to point of greatest width of cleft, 0.235–0.368 mm.
10. Distance from point of greatest width of mental cleft to apex of mentum, 0.365–0.457 mm.
11. Width of mentum, 1.378–1.412 mm.
12. Three setae near base of movable hook and three fixed hooks on a plane with the movable hook decreasing in size from the hook towards the mesial line.
13. One seta on either side of the median lobe of the mentum.
14. Length of thorax, 1.840–2.225 mm.
15. Length of meso-thoracic wing-pad, 0.693–0.911 mm. Length of meta-thoracic wing-pad, 0.650–0.864 mm.
16. Meta-thoracic wing-pad extends well upon the first abdominal segment.
17. Three tarsal joints.
18. Middle and distal tarsal joints subequal and nearly four times as long as the proximal joint.
19. Length of the abdomen, 4.836–6.120 mm.
20. Width of abdomen, 1.228–1.326 mm.
21. Entire body quite brown, the tenth, and sometimes the ninth, tergite black.
22. Cercoids not visible.

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[8] Three exuviae and one dead larva.

23. Light band just caudad of the middle of the tracheal gills, one further towards the apex and the apex light, the rest of the gills brown.
24. Length of tracheal gills: Right, 4.387–5.050 mm.; middle, 3.937–4.410 mm.; left, 4.365–4.793 mm.

Tertiult Instar[9]

1. Total length, 10.359–13.280 mm.
2. Length of head, 1.540–2.080 mm.
3. Width of head, 1.947–2.011 mm.
4. Width of eye, 0.363–0.393 mm.
5. Apical third of second antennal joint black, rest of the joints fuscous.
6. Antennae seven-jointed.
7. Length of antennal joints: First, 1.326–1.669 mm.; second, 0.428–0.479 mm.; third, 0.257–0.299 mm.; fourth, 0.156–0.201 mm.; fifth, 0.154–0.171 mm.; sixth, 0.128 mm.; seventh, 0.136 mm.
8. Length of mentum to base of mental cleft, 1.421–1.541 mm.
9. Distance from base of mental cleft to point of greatest width of cleft, 0.531–0.539 mm.
10. Distance from point of greatest width of mental cleft to apex of mentum, 0.426–0.629 mm.
11. Width of mentum, 1.562–1.755 mm.
12. Three setae at base of movable hook, the one nearest the hook small; three fixed hooks on plane with movable hook.
13. One seta on either side of the median lobe of mentum.
14. Length of thorax, 2.228–2.768 mm.
15. Length of meso-thoracic wing-pad, 1.228–1.562 mm. Length of meta-thoracic wing-pad, 1.207–1.583 mm.
16. Meta-thoracic wing-pad reaches to about the middle of the second abdominal tergite.
17. Tarsus three-jointed.
18. Middle and distal tarsal joints nearly equal in length and about four times the length of the proximal joint.
19. Length of abdomen, 6.691–8.688 mm.
20. Width of abdomen, 1.498–2.054 mm.

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[9] Three exuviae.

21. An apical dorso-lateral dark brown or black spot on each side of the first nine abdominal tergites; apical segments of abdomen darker.
22. Length of cercoids, 0.214–0.222 mm.
23. Tracheal gills brown with two light bands beyond the middle and with the apices light.
24. Length of tracheal gills: Right, 4.960–5.760 mm.; middle, 4.800–4.825 mm.; left, 5.280–5.760 mm.

Penult Instar[10]

1. Total length, 14.264–16.006 mm.
2. Length of head, 1.840–2.032 mm.
3. Width of head, 2.148–2.521 mm.
4. Width of eye, 0.415–0.505 mm.
5. Second antennal joint with apical third black, first and second segments darker than the apical segments, third segment in some cases little darker than the apical segments.
6. Antennae seven-jointed.
7. Length of antennal joints: First, 1.583–2.182 mm.; second, 0.556–0.684 mm.; third, 0.329–0.394 mm.; fourth, 0.222–0.248 mm.; fifth, 0.196–0.201 mm.; sixth, 0.124–0.149 mm.; seventh, 0.136–0.141 mm.
8. Length of mentum to base of median cleft, 1.797–1.934 mm.
9. Distance from base of mental cleft to point of greatest width of cleft, 0.599–0.757 mm.
10. Distance from point of greatest width of mental cleft to apex of mentum, 0.633–0.727 mm.
11. Width of mentum, 2.015–2.182 mm.
12. Three setae at base of movable hook, the one nearest the hook minute, three fixed hooks on plane with movable hook.
13. One seta on either side of the median lobe of the mentum.
14. Length of thorax, 3.200–3.432 mm.
15. Length of meso-thoracic wing-pad, 1.968–2.790 mm. Length of meta-thoracic wing-pad, 2.075–2.653 mm.
16. Meta-thoracic wing-pad extends to the apex of the second abdominal segment or even upon the third segment.

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[10] Three exuviae.

17. Three tarsal joints.
18. Middle and distal tarsal joints subequal in length and about four times as long as the proximal joint.
19. Length of the abdomen, 8.992–10.234 mm.
20. Width of abdomen, 1.934–2.225 mm.
21. Abdomen brown, an apical dorso-lateral black spot on each abdominal segment, except the last. Segment ten and a part of segment nine much darker than the other segments.
22. Length of cercoids, 0.333–0.342 mm.
23. Tracheal gills with a light or white band just caudad of the middle, another band between this and the apical light band.
24. Length of tracheal gills: Right, 6.416–7.680 mm.; middle, 5.522–6.240 mm.; left, 6.432–7.360 mm.

Ult Instar[11]

1. Total length, 16.439–17.356 mm.
2. Length of head, 2.195–2.311 mm.
3. Width of head, 3.415–3.616 mm.
4. Width of eye, 0.813–0.994 mm.
5. Lateral margin of first antennal joint black, the black extending caudad on head to compound eyes. Remainder of the first two antennal joints much darker than the apical joints.
6. Antennae seven-jointed.
7. Length of antennal joints: First, 2.225–2.653 mm.; second, 0.761–0.843 mm.; third 0.415–0.453 mm.; fourth, 0.273–0.299 mm.; fifth, 0.226–0.235 mm.; sixth, 0.158–0.175 mm.; seventh; 0.141–0.145 mm.
8. Length of mentum to base of median cleft, 2.045–2.225 mm.
9. Distance from base of median cleft of mentum to point of greatest width of cleft, 0.843–0.911 mm.
10. Distance from point of greatest width of mental cleft to apex of mentum, 0.830–0.987 mm.
11. Width of mentum, 2.311–2.482 mm.
12. Two setae at base of the movable hook; three fixed hooks on plane with the movable hook.[12]
13. One seta on each division of the median lobe of mentum.[13]

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[11] One exuvia and two dead larvae.

[12] Garman, 1927, p. 30, fig. 7, no. 10.

[13] Garman, *l. c.*, shows two setae.

14. Length of thorax, 4.080–4.761 mm.
15. Length of meso-thoracic wing-pad, 4.960–5.872 mm. Length of meta-thoracic wing-pad, 4.946–5.120 mm.
16. Meta-thoracic wing-pad extends well upon the fifth abdominal segment; the third and fourth abdominal tergites are entirely covered by the pads which are rounded and wide at the apices.
17. Three tarsal joints.
18. Middle and distal tarsal joints subequal in length and more than five times as long as the proximal joint when measured on the dorsal surface.
19. Length of abdomen, 9.920–10.400 mm.
20. Width of abdomen, 2.240–2.375 mm.
21. Abdomen dark with lateral margins of the segments lighter, middorsal line lighter brown, a dorso-lateral black spot at apex of each segment except the last.
22. Length of cercoids, 0.470–0.642 mm.
23. Tracheal gills with light apices and with white spots at bases on the dorsal surface, one or two orange-yellow or white bands between the apex and middle of the gills.
24. Length of tracheal gills: Right, 7.200–9.232 mm.; middle, 6.320–7.440 mm.; left, 7.520–8.881 mm.

Summary

The following larval changes, in addition to a gradual increase in size, were noted. They are numbered to correspond with the outline of varying characters.

5. In early instars the antennae are clear except the apical third of the second segment; later they are brown with the apical third of second segment black, the base of the second and all of the first joint are darker than the apical antennal joints; in the last instar the basal joint of the antennae is margined laterally with a wide black marking which extends to the head, to the compound eyes and upon the thorax.

6. Antennae are three-jointed in the first, four-jointed in the second and third, five-jointed in the fourth, fifth and sextult instars; in all following instars there are seven antennal joints. In the first instar the average lengths of the first and third joints are the same.

8 and 11. In the first four instars the length of the mentum from the base to the base of the cleft of the median lobe is greater than the width of the mentum; in all other instars the width of the mentum is greater than that length.

12. The minute seta nearest the base of the movable hook, present in all earlier instars, is not distinguishable in the last instar. The fixed hooks on a plane with the movable hook increase in number from one in the first instar to three in the fourth and succeeding instars.

13. In the first two instars the seta on either half of the median lobe of the mentum is minute or merely a marking visible under high magnification; later these setae are present and gradually increase in length in successive instars.

15. Wing-pads are not present in the first five instars, they are present in the sextult and following instars.

16. Meta-thoracic wing-pad reaches upon the first abdominal segment in quintult instar, on second tergite in tertiult instar, near apex of second abdominal tergite or even on the third tergite in the penult instar, on fifth abdominal segment in the last instar. In the last instar the wing-pads completely cover the first four abdominal tergites.

17. One tarsal joint in the first two instars, two in the third, and three in the following instars.

21. Abdomen becomes much darker in color in later instars, one or two latero-apical black spots on abdominal tergites, except the last, present in lateral instars.

22. Cercoids first noticed in the tertiult instar.

23. Tracheal gills at first with only one brown band; later they are brown with two light brown patches or bands beyond the middle and one at the apex. In some larvae light spots are present on upper surface at the bases of the gills in later instars.

Further differences as in mandibular armature, coloration, etc., are discussed under Larval Characters More or Less Constant, *anteà*.

Tentative Key to Larval Instars

a. Wing-pads absent.
  b. Length of mentum from base to mental cleft greater than width of mentum.
    c. Antennae three-jointed .... *1st instar.*
    cc. Antennae four- or five-jointed.
      d. One tarsal joint.......................... *2nd instar.*
      dd. Two tarsal joints......................... *3rd instar.*
      ddd. Three tarsal joints...................... *4th instar.*
  bb. Length of mentum from base of mentum to mental cleft less than width of mentum................ *5th instar.*
aa. Wing-pads present.
  e. Antennae five- or six-jointed, wing-pads not extending on abdomen .... *sextult instar.*
  ee. Antennae seven-jointed, wing-pads extending upon abdomen.
    f. About 7 mm. in length, wing-pads extend only to first abdominal segment, tracheal gills not more than 3.5 mm. in length .... *quintult instar.*
    ff. Between 8 and 9.5 mm. in length, tracheal gills more than 3.5, but less than 5.5, mm. in length, wing-pads extend well upon the first abdominal segment........ *quartult instar.*
    fff. Between 10 and 13.5 mm. in length, tracheal gills more than 4.5 mm. in length, meta-thoracic wing-pads reach to about the middle of the second abdominal segment *tertiult instar.*
    ffff. Between 14 and 17 mm. in length, tracheal gills more than 5.5 mm. in length.
      g. Wing-pads reach to apex of second abdominal segment or to the base of the third segment, cercoids not less than 0.3 mm. in length nor more than 0.4 mm. in length *penult instar.*
      gg. Wing-pads reach to fifth abdominal segment, cercoids more than 0.4 mm. in length............... *ult instar.*

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EXPLANATION OF PLATE XVII

All the figures refer to larvae of *Calopteryx* (*Agrion*) *maculata.*

Figs. 1 to 5. Dorsal views of the labium; 1, of a larva which died before the first molt; 2, 3 and 4, of exuviae of the second, third (larva no. 1) and fourth (larva no. 9) instars, respectively; 5, of a larva in the fifth instar (no. 9).

Figs. 6 to 11. Mandibles; 6 and 7, of a larva in the second instar, inner surfaces; 8 to 11, of a larva (no. 16) in the penult instar, 8 and 9, outer surfaces, 10 and 11 inner surfaces.

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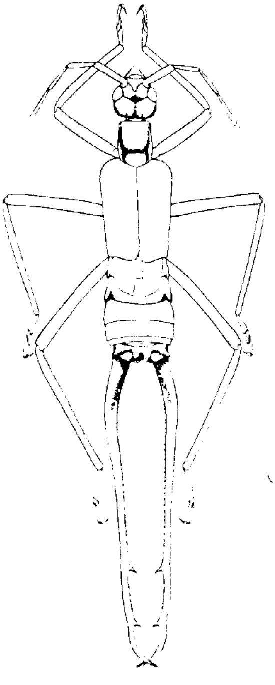

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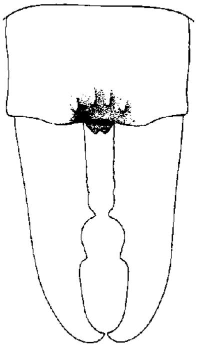

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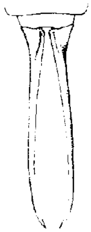

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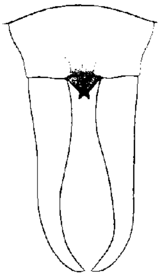

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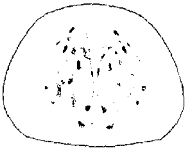
HEBARD—ORIENTAL DERMAPTERA



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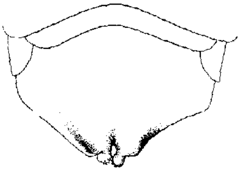

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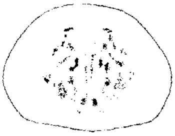

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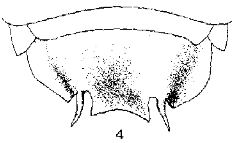

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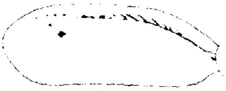

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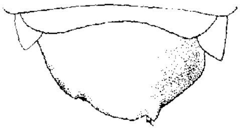

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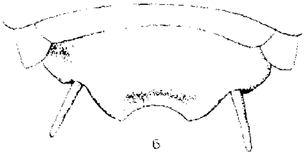

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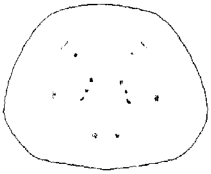

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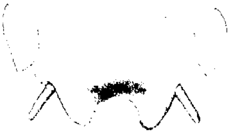

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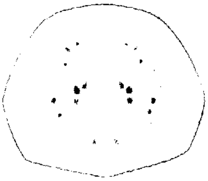

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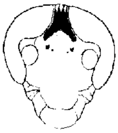

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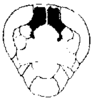

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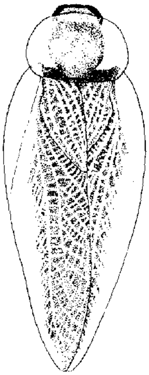

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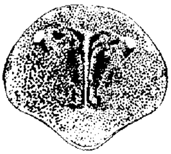

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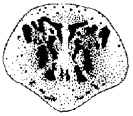

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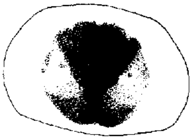

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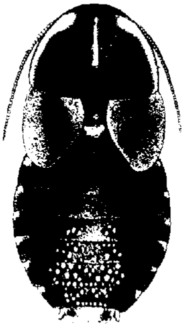

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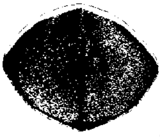

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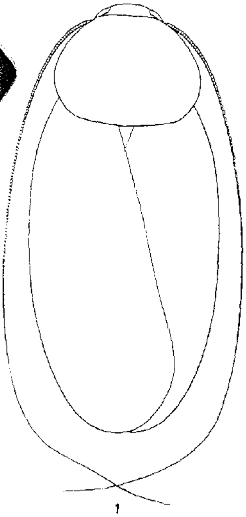

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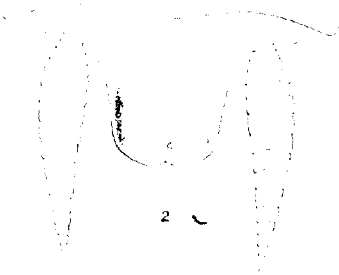

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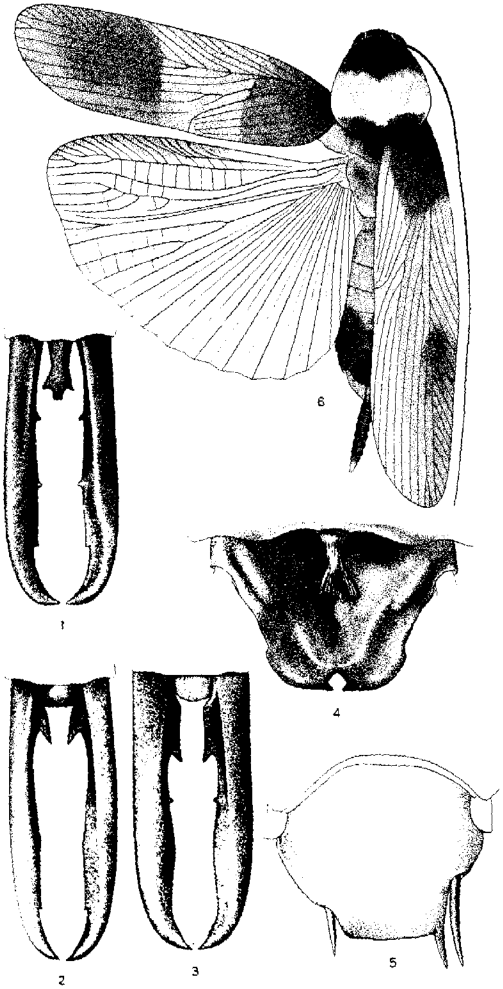
HEBARD—NEOTROPICAL BLATTIDAE



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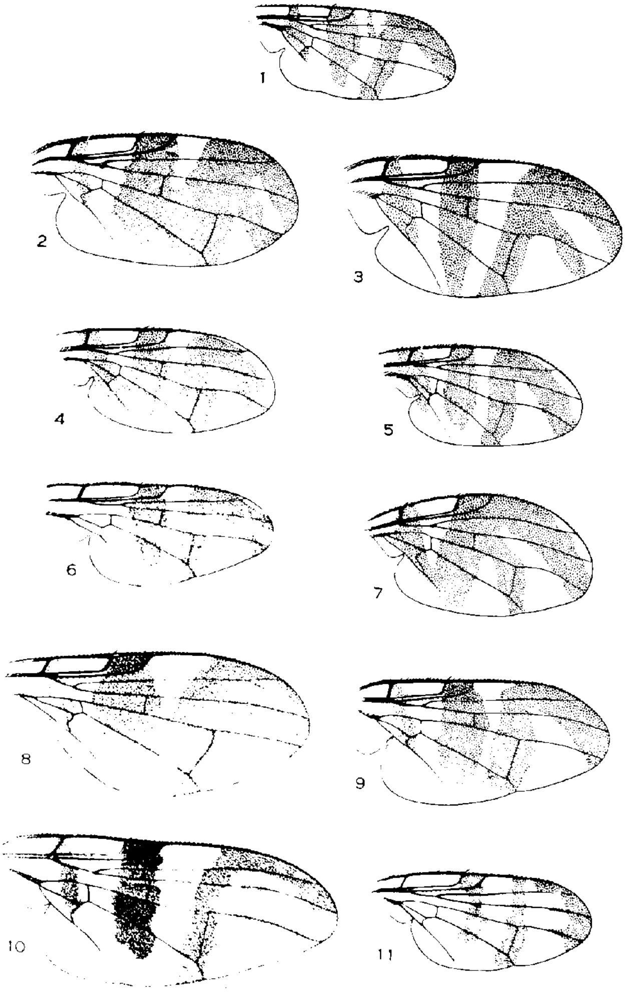
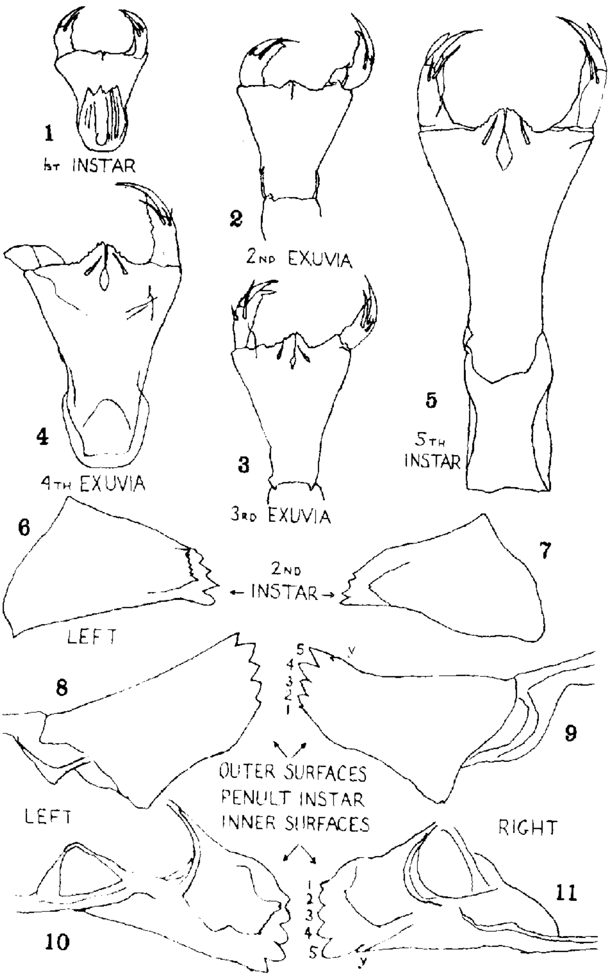


CRESSON—NORTH AMERICAN RHAGOLETIS



NEVIN—CALOPTERYX MACULATA